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U.S. DEPARTMENT OF THE INTERIOR  
PROTOTYPE OIL SHALE LEASING PROGRAM

TRACT C-b

QUARTERLY REPORT #2

(Through February 28, 1975)

Submitted to:

Mr. Peter A. Rutledge  
Area Oil Shale Supervisor  
Conservation District  
U. S. Geological Survey  
Grand Junction, Colorado

By:

Ashland Oil, Inc.  
Atlantic Richfield Company, Operator  
Shell Oil Company  
The Oil Shale Corporation

APRIL 14, 1975

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## I PRE-EXPLORATION ENVIRONMENTAL RECONNAISSANCE SURVEYS

Pre-exploration environmental reconnaissance surveys, as described in Quarterly Report #1, are conducted by a team of experts in the fields of plant ecology, animal ecology, archaeology and, as needed, aquatic ecology. These surveys are conducted prior to any appreciable disturbance of the Tract C-b area for the purpose of 1) ensuring that activities are not planned in significant habitat, vegetation, or archaeological areas, and 2) providing a record of existing conditions for use in later rehabilitation of the disturbed areas.

The only reconnaissance work required during this quarter for areas of potential ground disturbance was for the drilling of slant core holes. Reports from these investigations, insofar as they have been completed, are included on the following pages. Where investigations have not yet been performed because of snow conditions, the planned exploration activities have been postponed until these investigations are completed and any recommendations made by the investigators are evaluated. The present status of these slant core hole investigations is shown at the bottom of Table 1-1.



STATUS OF PRE-EXPLORATION ENVIRONMENTAL INVESTIGATIONS - 4/1/75

<u>LOCATION</u>	ARCHAEOLOGICAL EVALUATION	PLANT, ANIMAL, AND AQUATIC EVALUATION
Coreholes SG-1 through SG-21 and Roads	X	X
Surface Water Stations 1 through 13	X	---1
Support Facilities	X	X
Air Quality Sites (5) and Meteorological Tower	X	X
Alluvial Wells ("A" Series) 1 through 13	X	X
Relocation of Coreholes SG-6 and SG-7	X	X
Relocation of Corehole SG-17	X*	X
Relocation of Roads to SG-4 and SG-17	X	X
Biological Observation Plots	X*	X*
Powerlines	X	---2
Old Coreholes Cb-1, Cb-2, Cb-3, and Cb-4	X*	X
Old Coreholes 71-1, 71-2, 71-3, TG2-1, TG3-2 & Fed 2-b	X	X
Road to SG-18 ("CH-18")	X	X
Area Surrounding Aquifer Test Site	X	X
Road from Piceance Creek to Cottonwood and Sorghum Gulches	X	X
Road from Piceance Creek to Tract	X	---3
Road between Cottonwood and Sorghum Gulches	X	X
Slant Hole Drill Sites NQ22A (#1), SG-22 (#2), NQ22 (#3), NQ4 (#4), NQ7 and NQ12	X <sup>4</sup>	X

- \* evaluation received through verbal communication; no written report  
 1 installed by USGS prior to biological reconnaissance; minimal disturbance  
 2 minimal biological disturbance  
 3 judgment that improvement of already heavily-travelled road would not result in increase in biological disturbance  
 4 waiting for field examination on SG22





# WILLOW-GUIDE CONSULTANTS

CONSULTING ENGINEERS GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

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California 94010  
Phone (415) 692-5310

February 12, 1975  
74-669

Dr. Martin Redding  
Atlantic Richfield Company  
Two Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

Dear Dr. Redding:

As requested by Ms. Joan Gibbs of your office, our biological team conducted a reconnaissance of four proposed slant hole sites on Tract C-b during the week of January 13, 1975. Site Nos. 1, 2, and 3 are located at the upper end of the west fork of Cottonwood Gulch, the upper end of the east fork of Cottonwood Gulch, and adjacent to the southern boundary of the aquifer test site overlooking Cottonwood Gulch, respectively. Site No. 4 is located on a ridge overlooking Scandard Gulch one-half mile southeast of Core Hole 4. We understand that each drill pad will have dimensions of 50 feet by 75 feet. Dr. Joe Merino, the head of our biological team, reports as follows on the reconnaissance.

The first three sites are located entirely within a chained pinyon-juniper area. Vegetation consists of species characteristic of the mountain shrub association (i.e., mountain mahogany, serviceberry, bitterbrush, etc.). The fourth site is located within a chained pinyon-juniper area which is bordered by a pinyon-juniper woodland. Vegetation consists mainly of sagebrush and some mountain shrub association plants. Along the northeast boundary of the pad, three pinyon trees, including a large mature pinyon, and two juniper trees will be removed when the drill pad is constructed. None of the sites appear to be rare or unique in an ecological sense.

All four drill sites are similar to areas currently under thorough study on Tract C-b. Individually, these sites along with access roads will have a minimal ecological impact. However, as more drill sites and roads are cleared of all vegetation, the impact is compounded. Removal of deer browse

I A-1

Dr. Martin Redding

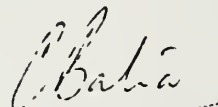
-2-

February 12, 1975

and small animal habitat will result from the planned activity on the proposed drill pads.

Whenever possible, existing roads should be used as access roads to the drill sites.

Sincerely,



C. Batra  
Program Manager, Industry

cc: Dr. Joe Merino  
→ Ms. Carol Hopkins  
Ms. Joan Gibbs





Department of Anthropology  
Laboratory of Public Archaeology

Colorado State University  
Fort Collins, Colorado  
80523

March 10, 1975

Ms. Carol Hopkins  
Atlantic Richfield Co.  
Two Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

Dear Carol:

In reference to your letter of February 11, I can provide you with the following information.

Drill Site NQ22A: No further field examination is necessary. We surveyed the entire southeastern quarter of Section 12 during the baseline study last summer. There are no archaeological sites in the quarter section.

Drill Site NQ4: No further field examination is necessary. The locality was examined in the process of clearing the alignment of the road to SG4 last summer. No archaeological sites will be endangered by the drilling.

Drill Site SG22: We will have to examine this site as there has been no previous work in the locality close enough to the drill site to warrant clearing the activity. We will have to wait until the snow cover conditions have reached a point where a reliable examination can be conducted. I will notify you when we have completed the work.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Cal'.

Calvin H. Jennings  
Director

CHJ/apm













## II A SURFACE WATER

During the second quarterly report period, water samples were obtainable from six of the thirteen stations on and near Tract C-b. (Tables II A-1 through II A-6). A separate set of samples was also collected from the four major stations by the U.S.G.S. during the week of December 4, 1974, and forwarded to Denver for analysis of organic components. Most of the stations remained dry, however, although a considerable quantity of snow fell during the report period. Snow surveys are underway, and a summary of the results will be available later in the spring. Weather conditions were quite severe at times and temperatures reached  $-52^{\circ}\text{F.}$  at the Rock School meteorological station. As a result, many of the streams were frozen over, and automated measurements were difficult, if not impossible to obtain.

The data from U.S.G.S. Station No. 09306039 Cottonwood Gulch near Rio Blanco (Table II A-4 on page II A-5) represent the discharge water from the upper zone aquifer pumping test of AT-1. The test well is located approximately two miles up the gulch and was discharging approximately 1 cfs from the well head at the time. The loss in water (.38 cfs at the gauging station vs. 1 cfs at the well head) occurred because water seeped into the two mile stretch of dry stream bed.





## II A-1 STREAMS

Tables II A-1 through II A-6 immediately following are summary tables by sample collection date of surface water quality analyses. The lab sheets and the U.S.G.S. computer printouts follow those summary tables.



TABLE 11-A-1  
PISCANCE CREEK BELOW RIO BLANCO  
U.S.G.S. NO. 09306007  
OCTOBER 1974 - FEBRUARY 1975

	10/4	10/9	10/16	10/23	10/31	11/6	11/20	12/4	12/18	12/31	1/15/75	2/3	
(*) 1. Alkalinity (mg/l)	340	362	419	415	478	472	450	424	442	454	455	461	
(*) 2. Aluminum (ug/l)								450					
3. Aromatics, Polycyclic													
4. Arsenic (ug/l)	2	3	2	1	1	2	4	3	3	1	1	5	
5. Barium (ug/l)	0	<100	100	0	100	<100	<100	150	100	100	0	100	
(*) 6. Beryllium (ug/l)								<1					
7. Bicarbonate (mg/l)	537	503	548	542	583	576	524	517	539	554	552	562	
(*) 8. Bismuth (ug/l)								<5					
9. Boron (ug/l)	260	290	200	280	190	250	250	150	220	210	240	190	
10. Cadmium (ug/l)	<1	<1	0	0	0	1	0	<15	0	0	2	0	
11. Carbonate (mg/l)	0	0	0	0	0	0	0	0	0	0	0	0	
(*) 12. Carbon Dioxide (mg/l)							8.4	5.2	3.4	4.4	7.0	.9	
13. Chloride (mg/l)	16	17	16	16	15	16	16	13	15	14	16	19	
14. Chromium (ug/l)								<5	0	0	10	0	
(*) 15. Cobalt (ug/l)								<5					
16. COP								9					
17. Coliform, Total & Fecal								5	2	3	5	3	
18. Color													
19. Conductivity, Specific (uv)	1140	1190	1160	1160	1180	1200	1090	1070	1200	1100	1200	1120	
20. Copper (ug/l)	1	6	0	0	1	2	1	1	1	0	8	1	
21. Cyanide (mg/l)								.00	.00	.00	.00	.00	
22. Discharge (CFR)	--	2.9	4.1	5.3	--	6.0	9.5	9.8	11	7.8	9.5	12	
23. Dissolved Oxygen													
24. Fluoride (mg/l)	1.1	1.1	1.0	1.2	1.0	1.0	1.0	1.1	1.0	1.1	1.2	1.1	
(*) 25. Gallium (ug/l)								<3					
(*) 26. Germanium (ug/l)								<5					
(*) 27. Hardness (Ca, Mg) (mg/l)	370	350	380	360	400	360	350	330	390	360	370	370	
(*) 28. Hardness, Non-Carbonate (mg/l)	0	0	0	0	0	0	0	0	0	0	0	0	
29. Iron (ug/l)	30	60	60	80	40	390	10	300	10	10	20	20	
30. Kjeldahl Nitrogen								.30	.33	.25	.48	.61	
31. Lead (ug/l)	0	4	3	1	1	3	2	<5	1	0	7	6	
32. Lithium (ug/l)	0	0	0	0	0	0	0	8	20	20	20	20	
33. Magnesium (mg/l)	49	43	50	46	50	42	42	45	48	43	46	46	
34. Manganese (ug/l)	100	170	160	140	230	230	110	100	80	50	60	67	
35. Mercury (ug/l)	.0	.0	.0	.0	.0	.0	.0	<.1	<.1	.0	.1	.1	
(*) 36. Molybdenum (ug/l)								7					
(*) 37. Nickel (ug/l)								<4					
38. Nitrate (mg/l)	.07	.03	.02	.00	.04	.07	.26	.38	.33	.43	.56	.52	
39. Nitrite (mg/l)								.00	.02	.00	.01	.01	
40. Odor													
41. Oil & Grease								0	1	1	8	6	
42. Ortho-Phosphate (mg/l)	.00	.03	.00	.00	.09	.09	.03	.06	.09	.15	.06	.12	
(*) 43. Ortho-Phosphorus (mg/l)	.00	.01	.00	.00	.03	.03	.01	.02	.03	.05	.02	.04	
44. Pesticides													
45. pH								8.2	8.4	8.3	8.1	9.0	
46. Potassium (mg/l)	2.8	3.1	3.3	3.5	3.8	3.8	2.9	2.4	2.9	2.9	3.4	2.6	
47. Selenium (ug/l)	1	0	0	0	0	0	1	1	2	1	1	1	
48. Silica (mg/l)	17	17	17	16	18	16	15	15	3.4	16	17	16	
(*) 49. Silver (ug/l)								0					
50. Sodium (mg/l)	140	150	140	130	140	140	130	120	130	120	150	150	
(*) 51. Sodium Adsorption Ratio	3.2	3.5	3.1	3.0	3.1	3.2	3.0	2.9	2.9	2.8	2.9	2.9	
(*) 52. Sodium (%)	45	48	41	44	43	46	44	44	42	42	43	43	
53. Solids, Dissolved (mg/l)	750	749	738	718	762	739	698	664	715	697	725	736	
54. Solids, Suspended													
(*) 55. Strontium (ug/l)								1800					
56. Sulfate (mg/l)	170	170	170	170	170	160	160	150	170	150	160	170	
57. Sulfide								.0	.5	.9	.0	.1	
58. Temperature (°C)	13.0	14.0	13.0	11.0	5.0	5.0	4.0	4.0	.0	1.0	1.0	1.0	
(*) 59. Tin (ug/l)								<5					
(*) 60. Titanium (ug/l)								25					
61. Turbidity								20	20	6	30	10	
(*) 62. Vanadium (ug/l)								<3.0					
63. Zinc (ug/l)	20	60	50	0	30	30	10	<15	0	10	40	20	
64. Zirconium (ug/l)								<10					
65. Calcium (mg/l)	69	69	70	68	76	75	71	58	76	73	74	72	
66. Complete Element Scan													
67. Radioactivity													
Gross Alpha (pci)													
Radium 226*													
Gross Beta													
Thorium 230**													
Uranium **													
68. Total Organic Carbon (TOC)													
If TOC > 10 mg/liter, then													
Nitrogen (Long Extraction)													
Organic Carbon, Dissolved													
Organic Carbon, Suspended													
Phenols													
Sulfur (Acid Extraction)													

(\*) Not Required

\* Required if Gross Alpha > 4 picocuries per liter (pci)  
\*\* Required if Gross Beta > 100 picocuries per liter (pci)

N Non-Instantaneous Discharge

NOTE: A number preceded by a less than (<) sign represents the lowest detectable limit for the analytical method used for that particular sample run. Analytical method and thus lower limit may change across sample runs even for a single element.

TABLE 11-A-2  
STEWART CREEK AB WEST FORK NR RIO BLANCO  
U.S.G.S. No. 09306022  
OCTOBER 1974 - FEBRUARY 1975

	10/4	10/9	10/16	10/25	10/30	11/6	11/20	12/4	12/17	12/30	1/15/75	2/3	
(*) 1. Alkalinity (mg/l)	387	404	396	422	421	436	611	403	472	405	418	426	
(*) 2. Aluminum (ug/l)													
3. Aromatics, Polycyclic													
4. Aromatic (ug/l)	1	1	1	1	0	1	4	1	2	0	1	3	
5. Barium (ug/l)	0	<100	<100	0	<100	<100	<100	<100	100	<100	100	<100	
(*) 6. Beryllium (ug/l)													
7. Bicarbonate (mg/l)	472	492	483	514	513	531	782	491	575	494	510	519	
(*) 8. Bismuth (ug/l)													
9. Boron (ug/l)	110	100	50	110	30	120	530	90	260	80	120	70	
10. Cadmium (ug/l)	0	<1	0	0	0	3	0	1	1	0	1	1	
11. Carbonate (mg/l)								0	0	0	0	0	
(*) 12. Carbon Dioxide (mg/l)								3.9	3.7	5.0	5.1	1.3	
13. Chloride (mg/l)	6.5	6.3	6.0	6.6	6.1	6.9	16	6.5	11	7.6	6.7	7.0	
14. Chromium (ug/l)								<10	<10	0	10	0	
(*) 15. Cobalt (ug/l)													
16. COD								5	--				
17. Coliform, Total & Fecal													
18. Color								3	3	3	5	3	
19. Conductivity, Specific (umr)	1550	1370	1360	1400	1370	1460	1750	1360	1300	750	1400	1400	
20. Copper (ug/l)	1	0	0	0	0	2	0	5	1	1	3	8	
21. Cyanide (mg/l)								.00	.00	.00	.00	.01	
22. Discharge (CFS)	--	2.1	1.9	1.8	1.3	2.1	2.4	2.4	2.1	2.0	2.3	1.7	
23. Dissolved Oxygen													
24. Fluoride (mg/l)	.2	.2	.2	.3	.3	.6	3.3	.2	1.2	.2	.2	.4	
(*) 25. Gallium (ug/l)													
(*) 26. Germanium (ug/l)													
(*) 27. Hardness (Ca, Mg) (mg/l)	460	560	520	550	550	560	490	560	560	530	550	570	
(*) 28. Hardness, Non-Carbonate (mg/l)	75	150	130	100	130	120	0	150	85	130	130	140	
29. Iron (ug/l)	20	50	50	20	20	620	20	10	10	20	10	10	
30. Kjeldahl Nitrogen								.22	.32	.14	.40	.45	
31. Lead (ug/l)	1	2	2	1	2	3	2	5	1	2	7	6	
32. Lithium (ug/l)	0	0	0	0	0	0	40	<10	20	10	10	10	
33. Magnesium (mg/l)	68	76	69	70	74	75	64	75	77	71	6	78	
34. Manganese (ug/l)	0	10	0	0	0	20	0	20	0	0	10	40	
35. Mercury (ug/l)	.0	.0	.0	.0	.0	.0	.0	<.1	<.1	.0	.0	.0	
(*) 36. Molybdenum (ug/l)													
(*) 37. Nickel (ug/l)													
38. Nitrate (mg/l)	1.5	1.4	1.6	1.5	1.6	1.7	1.6	1.7	1.7	1.8	1.8	1.9	
39. Nitrite (mg/l)								.00	.00	.00	.01	.01	
40. Odor													
41. Oil & Grease								2	1	1	7	9	
42. Ortho-Phosphate (mg/l)	.06	.03	.03	.00	.03	.09	.05	.03	.03	.15	.03	.12	
43. Ortho-Phosphorus (mg/l)	.02	.01	.01	.00	.01	.03	.01	.01	.01	.05	.01	.01	
44. Pesticides													
45. pH								8.3	8.4	8.2	7.2	8.8	
46. Potassium (mg/l)	2.0	1.6	1.9	1.9	2.3	2.0	2.4	1.1	1.4	2.0	1.7	1.6	
47. Selenium (ug/l)	1	1	0	1	1	1	2	1	1	1	1	1	
48. Silica (mg/l)	16	15	16	17	17	16	16	15	15	15	15	16	
(*) 49. Silver (ug/l)													
50. Sodium (mg/l)	130	120	120	120	120	130	250	120	130	120	120	120	
(*) 51. Sodium Adsorption Ratio	2.6	2.2	2.3	2.3	2.2	2.4	4.0	2.2	2.4	2.3	2.3	2.3	
(*) 52. Sodium (%)	38	32	33	33	32	34	53	32	34	33	32	32	
53. Solids, Dissolved (mg/l)	865	946	915	921	919	950	1160	927	963	936	953	956	
54. Solids, Suspended													
(*) 55. Strontium (ug/l)													
56. Sulfate (mg/l)	330	380	360	350	340	350	330	360	340	370	380	370	
57. Sulfide								.0	.2	.7	.3	.1	
58. Temperature (°C)	10.0	10.5	8.0	9.0	8.0	8.0	6.0	5.0	1.0	6.0	4.5	6.0	
(*) 59. Tin (ug/l)													
(*) 60. Titanium (ug/l)													
61. Turbidity								30	10	3	8	5	
(*) 62. Vanadium (ug/l)													
63. Zinc (ug/l)	20	40	20	20	30	90	370	30	20	20	20	20	
64. Zirconium (ug/l)													
65. Calcium (mg/l)	73	98	96	95	99	99	89	99	96	97	93	98	
66. Complete Element Scan													
67. Radioactivity													
Gross Alpha (pci)													
Radium-226*													
Gross Beta													
Thorium-230**													
Uranium**													
68. Total Organic Carbon (TOC)													
If TOC > 10 mg/liter, then													
Nitrogen (Purge Extraction)													
Organic Carbon, Dissolved													
Organic Carbon, Suspended													
Phenols													
Sulfur (Acid Extraction)													

(\*) Not Required

\* Required if Gross Alpha > 4 picocuries per liter (pci)

\*\* Required if Gross Beta > 100 picocuries per liter (pci)

N Non-Instantaneous Discharge

NOTE: A number preceded by a less than (<) sign represents the lowest detectable limit for the analytical method used for that particular sample run. Analytical method and thus lower limit may change across sample runs even for a single element.



OCTOBER 1974 - FEBRUARY 1975

(\*) Not Required

R Non-Instantaneous Discharge

11 A-1

12/5/ .

(\*) Not Required

N Non-Instantaneous Discharge

11 A-5



TABLE 11-A-5  
WILLOW CREEK NEAR RIO BLANCO  
U.S.G.S. No. 09306058  
OCTOBER 1974 - FEBRUARY 1975

	10/4	10/9	10/17	10/23	10/31	11/6	11/20	12/6	12/17	1/3/75	1/16	2/3		
(*)1. Alkalinity (mg/l)	409	419	417	419	450	449	476	457	458	428	412	436		
(*)2. Aluminum (ug/l)								520						
3. Aromatic, Polycyclic														
4. Arsenic (ug/l)	1	2	1	1	1	0	2	1	1	0	1	4		
5. Barium (ug/l)	0	0	<100	0	<100	<100	<100	95	<100	<100	0	100		
(*)6. Beryllium (ug/l)								<2						
7. Bicarbonate (mg/l)	499	511	509	511	539	548	580	553	551	522	511	531		
(*)8. Bismuth (ug/l)								<6						
9. Boron (ug/l)	70	140	90	160	80	150	70	66	120	110	120	110		
10. Calcium (ug/l)	0	<1	0	0	0	1	0	<20	1	0	0	1		
11. Carbonate (mg/l)								0	0	0	0	0		
(*)12. Carbon Dioxide (mg/l)								5.4	1.7	8.4	6.5	27		
13. Chloride (mg/l)	10	11	9.9	10	11	10	11	11	11	10	9.5	12		
14. Chromium (ug/l)								<6	<10	0	10	0		
(*)15. Cobalt (ug/l)								<6						
16. COP								35						
17. Coliform, Total & Fecal														
18. Color								5	5	3	5	0		
19. Conductivity, Specific (uv)	1370	1390	1380	1400	1440	1460	1470	3500	1500	1200	1350	1500		
20. Copper (ug/l)	2	2	0	0	0	2	1	5	0	0	2	4		
21. Cyanide (mg/l)								.00	.01	.00	.00	.00		
22. Discharge (CFS)	--	.56	.58	.77	--	.95	1.4	3.3	2.8	2.4	2.5	--		
23. Dissolved Oxygen														
24. Fluoride (mg/l)	.4	.4	.4	.5	.4	.2	.4	.3	.4	.4	.4	.3		
(*)25. Gallium (ug/l)								<3						
(*)26. Germanium (ug/l)								<6						
(*)27. Hardness (Ca, Mg) (mg/l)	460	490	540	490	560	570	540	560	580	550	550	550		
(*)28. Hardness, Non-Carbonate (mg/l)	51	74	150	69	110	120	68	120	140	120	110	120		
29. Iron (ug/l)	20	40	20	40	20	520	30	300	10		40	10		
30. Kjeldahl Nitrogen								.39	.20	.25	.48	1.0		
31. Lead (ug/l)	1	7	3	3	1	5	1	<6	1	1	5	2		
32. Lithium (ug/l)	0	0	0	0	0	0	0	5	10	10	10	0		
33. Magnesium (mg/l)	73	76	72	70	76	77	72	74	79	76	70	74		
34. Manganese (ug/l)	0	0	0	10	0	10	20	70	0	20	10	30		
35. Mercury (ug/l)	.0	.0	.0	.0	.0	.0	.0	<.1	<.1	.2	.0	.2		
(*)36. Molybdenum (ug/l)								3						
(*)37. Nickel (ug/l)								<1						
38. Nitrate (mg/l)								.40	.41	.40	.60	.43		
39. Nitrite (mg/l)								.00	.00	.00	.01	.00		
40. Odor														
41. Oil & Grease								4	1	7	6	5		
42. Ortho-Phosphate (mg/l)	.09	.09	.03	.03	.03	.03	.03	.09	.03	.03	.06	.15		
(*)43. Ortho-Phosphorus (mg/l)	.03	.03	.01	.01	.01	.01	.01	.03	.01	.01	.02	.05		
44. Pesticides														
45. pH								8.2	8.7	8.0	8.1	7.5		
46. Potassium (mg/l)	2.5	1.1	2.3	2.5	2.9	2.3	2.6	1.8	1.5	1.7	2.0	2.3		
47. Selenium (ug/l)	1	1	1	1	0	1	1	1	1	2	1	1		
48. Silica (mg/l)	17	18	17	18	15	8.2	17	16	16	15	16	17		
(*)49. Silver (ug/l)								0						
50. Sodium (mg/l)	150	140	120	130	130	150	140	120	120	120	120	120		
(*)51. Sodium Adsorption Ratio	2.6	2.7	2.2	2.6	2.4	2.4	2.6	2.2	2.2	2.2	2.3	2.2		
(*)52. Sodium (%)	38	38	32	37	33	33	36	32	31	32	33	32		
53. Solids, Dissolved (mg/l)	875	925	914	895	948	950	982	922	924	908	890	940		
54. Solids, Suspended														
(*)55. Strontium (ug/l)								3500						
56. Sulfate (mg/l)	350	350	340	350	340	350	350	350	330	350	320	350		
57. Sulfide								.2	.5	.1	.1	.1		
58. Temperature (°C)	11.5	14.0	8.0	11.0	6.5	9.0	8.5		3.7	.0	3.5	3.5		
(*)59. Tin (ug/l)								<6						
(*)60. Titanium (ug/l)								10						
61. Turbidity								70	30	9	40	30		
(*)62. Vanadium (ug/l)								<3.0						
63. Zinc (ug/l)	10	10	30	10	20	10	20	20	10	20	20	30		
64. Zirconium (ug/l)								<15						
65. Calcium (mg/l)	64	72	92	80	100	100	99	100	100	95	97	100		
66. Complete Element Scan														
67. Radioactivity														
Gross Alpha (pCi)														
Radium 226*														
Gross Beta														
Thorium 230**														
Uranium **														
68. Total Organic Carbon (TOC)														
If TOC > 10 mg/liter, then														
Nitrogen (Base Extraction)														
Organic Carbon, Dissolved														
Organic Carbon, Suspended														
Phenols														
Sulfur (Acid Extraction)														

(\*) Not Required

\* Required if Gross Alpha > 4 picocuries per liter (pCi)  
\*\* Required if Gross Beta > 100 picocuries per liter (pCi)

Non-Instantaneous Discharge

NOTE: A number preceded by a less than (<) sign represents the lowest detectable limit for the analytical method used for that particular sample run. Analytical method and thus lower limit may change across sample runs even for a single element.

TABLE II-A-6  
 PICEANCE CREEK AB HUNTER CREEK, Nr RIO BLANCO  
 U.S.G.S. No. 09306061  
 OCTOBER 1974 - FEBRUARY 1975

	10/4	10/17	10/24	10/31	11/6	11/20	12/6	12/18	1/3/75	1/16	2/3			
(*)1. Alkalinity (mg/l)	504	502	512	544	509	470	463	453	459	447	485			
(*)2. Aluminum (ug/l)														
3. Aromatics, Polycyclic														
4. Arsenic (ug/l)	2	2	2	1	2	4	5	2	0	1	5			
5. Barium (ug/l)	0	<100	0	<100	<100	<100	<100	<100	<100	0	<100			
(*)6. Beryllium (ug/l)														
7. Bicarbonate (mg/l)	615	612	661	663	620	573	565	552	559	545	591			
(*)8. Bismuth (ug/l)														
9. Boron (ug/l)	270	200	230	170	220	200	220	160	170	180	150			
10. Cadmium (ug/l)	0	0	0	0	5	0	1	2	0	1	1			
11. Carbonate (mg/l)							0	0	0	0	0			
(*)12. Carbon Dioxide (mg/l)							4.5	4.4	3.6	6.9	30			
13. Chloride (mg/l)	14	14	14	15	15	13	12	12	13	12	15			
14. Chromium (ug/l)							0	0	0	10	10			
(*)15. Cobalt (ug/l)														
16. COD							12							
17. Coliform, Total & Fecal														
18. Color							5	5	5	0	--			
19. Conductivity, Specific (uwr)	1500	1170	1530	1560	1490	1340	1220	1100	1000	1390	1300			
20. Copper (ug/l)	4	0	2	2	2	0	2	1	2	2	5			
21. Cyanide (mg/l)							.00	.00	.00	.00	.00			
22. Discharge (CFS)	--	6.3	6.2	--	5.6	--	19	35	--	14	--			
23. Dissolved Oxygen														
24. Fluoride (mg/l)	.7	.6	.6	.7	.6	.7	.6	.7	.7	.7	.6			
(*)25. Gallium (ug/l)														
(*)26. Germanium (ug/l)														
(*)27. Hardness (Ca, Mg) (mg/l)	450	490	550	560	520	450	490	460	500	460	500			
(*)28. Hardness, Non-Carbonate (mg/l)	0	0	0	11	13	0	26	8	39	14	11			
29. Iron (ug/l)	10	30	30	10	460	10	110	10	10	10	30			
30. Kjeldahl Nitrogen							1.4	.58	.93	.52	.46			
31. Lead (ug/l)	0	.3	2	0	5	2	1	2	3	6	2			
32. Lithium (ug/l)	0	0	0	0	0	0	10	10	10	10	10			
33. Magnesium (mg/l)	69	69	78	82	75	60	66	61	68	64	67			
34. Manganese (ug/l)	0	150	170	140	150	60	40	30	50	20	40			
35. Mercury (ug/l)	.0	.0	.0	.0	.0	.0	<.1	<.1	.0	.0	.1			
(*)36. Molybdenum (ug/l)														
(*)37. Nickel (ug/l)														
38. Nitrate (mg/l)	.31	.29	.27	.19	.18	.55	.61	.79	.73	.77	.68			
39. Nitrite (mg/l)							.01	.00	.00	.01	.01			
40. Odor														
41. Oil & Grease							8	3	9	7	8			
42. Ortho-Phosphate (mg/l)	.18	.09	.12	.09	.03	.03	.06	.03	.09	.06	.25			
43. Ortho-Phosphorus (mg/l)	.06	.03	.04	.03	.01	.01	.02	.01	.03	.02	.08			
44. Pesticides														
45. pH							8.3	8.3	8.4	8.1	7.5			
46. Potassium (mg/l)	1.2	3.8	4.3	3.5	4.0	3.0	2.6	2.5	2.8	2.6	2.7			
47. Selenium (ug/l)	1	1	1	0	1	1	1	1	2	1	1			
48. Silica (mg/l)	20	19	19	19	17	17	16	19	16	17	17			
(*)49. Silver (ug/l)														
50. Sodium (mg/l)	180	180	170	180	170	150	140	140	140	140	110			
(*)51. Sodium Adsorption Ratio	3.8	5.5	5.2	5.3	5.2	5.1	2.8	2.8	2.7	2.8	2.7			
(*)52. Sodium (%)	48	44	41	41	41	42	38	40	38	40	38			
53. Solids, Dissolved (mg/l)	949	992	1030	1050	1000	870	887	886	907	878	944			
54. Solids, Suspended														
(*)55. Strontium (ug/l)														
56. Sulfate (mg/l)	300	320	330	330	330	260	280	290	300	290	320			
57. Sulfide							.2	.5	.0	.0	.2			
58. Temperature (°C)	14.0	14.0	10.0	8.0	10.0	6.5	5.0	2.5	.0	1.0	.0			
(*)59. Tin (ug/l)														
(*)60. Titanium (ug/l)														
61. Turbidity							80	40	20	30	10			
(*)62. Vanadium (ug/l)														
63. Zinc (ug/l)	10	10	20	0	10	10	30	0	10	30	30			
64. Zirconium (ug/l)														
65. Calcium (ug/l)	89	82	83	87	85	81	87	84	87	79	88			
66. Complete Element Scan														
67. Radioactivity														
Gross Alpha (pci)														
Radium 226*														
Gross Beta														
Thorium 230**														
Uranium **														
68. Total Organic Carbon (TOC)														
If TOC > 10 mg/liter, then														
Nitrogen (Base Extraction)														
Organic Carbon, Dissolved														
Organic Carbon, Suspended														
Hexonin														
Sulfur (Acid Extraction)														

(\*) Not Required

\* Required if Gross Alpha > 4 picocuries per liter (pci)  
 \*\* Required if Gross Beta > 100 picocuries per liter (pci)

N Non-Instantaneous Discharge

NOTE: A number preceded by a less than (<) sign represents the lowest detectable limit for the analytical method used for that particular sample run. Analytical method and thus lower limit may change across sample runs even for a single element.



# THE OIL SHALE CORPORATION

## INTER OFFICE MEMORANDUM

NEW YORK ☐  
DENVER ☒  
LOS ANGELES ☐

LABORATORY DATA LETTER 75-24


FROM:	F. C. Haas	DATE:	February 12, 1975
		FILE NO.:	5100-3
TO:	File	SUBJECT:	Total Organic Carbon Analysis on C-b Surface Waters Project No. 197

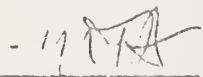
Five surface water samples were submitted by the USGS (delivered by J. Matis) for total organic carbon (TOC) analysis. Analysis was done by Commercial Testing & Engineering, Golden, Colorado. Analytical reports are attached. Four of the samples contained less than 1 mg/liter TOC. One sample, No. 09306039 contained 27 mg/liter TOC. After filtering on 0.45 micron filter paper, the sample contained 3 mg/liter DOC (dissolved organic carbon).

TOSCO Rocky Flats then did an organic extraction to separate acids, bases, phenols and neutral oils. A portion of the same sample was filtered through Whatman No. 1 to remove the sand and the organic extraction was made on the filtrate. A total of only 1.2 mg/liter organic material was extracted. The sand portion was then extracted and an equivalent of an additional 0.3 mg/liter was recovered for a total of 1.5 mg/liter organic material.

Two possible explanations for the discrepancy between TOC and extractable organics is that the organics may boil below about 80°C or the organic material is highly water soluble, e.g., starches, sugars or humates. In the extraction scheme chloroform is used as the solvent and is subsequently evaporated off at approximately 40°C under vacuum.

No further work is planned.

  
FCH/aw  
Encs.

- 11   
Approved (MTA)

cc: Messrs. Vawter, Spence, Schulman, Cleveland, Schillinger,  
Legatski (ARCO), Matis (ARCO) and Tait (ARCO)

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-8434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

14 January 75

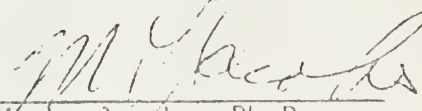
Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Re: IAD #97-199-002-05

## Analytical Report

		TOC * mg/liter
09306007	12/10/74 @ 11:10 temp 3.0°C	<1
09306039	12/10/74 @ 14:00 temp unk G.H. 1.45	27
09306061	12/10/74 @ 13:00 temp 6.0° G.H. 1.70	27 < 1
09306058	12/10/74 @ 12:30 temp 5.0° G.H. Well frozen	<1
09306028	12/10/74 @ 11:00 temp 2.0° G.H. 1.22	<1

\* Test performed on sample marked "Regular" by an Outside Laboratory.

  
M. L. Jacobs, Ph.D.  
Analyst

MLJ/dh

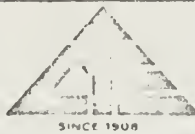
RECEIVED  
JAN 17 1975  
TOSCO/GOLDEN

II A-9



**COMMERCIAL TESTING & ENGINEERING CO.**

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-0434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

29 January 75

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Re: IAD #97-199-002-05

Analytical Report

As per your instruction, any sample that was greater than 10 mg/liter, TOC was to be rerun for DOC.

DOC  
mg/liter

09306039 12/10/74 @ 14:00 temp unk G.H. 1.45

3

Please note sample correction:

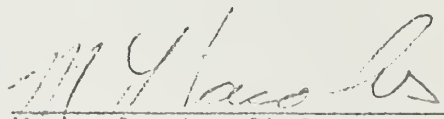
TOC  
mg/liter

09306039 12/10/74 @ 14:00 temp unk G.H. 1.45

27

09306061 12/10/74 @ 13:00 temp 6.0°G.H. 1.70

&lt;1

  
M. L. Jacobs, Ph.D  
Divisional Manager

MLJ/dh

RECEIVED

JAN 30 1975

11 A-10

TOSCO/GOLDEN



## WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (00000)	TEMPER- ATURE (DEG C) (00010)	DIS- CHARGE (CFS) (00060)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00061)	TUR- BID- ITY (JHU) (00070)	COLOR (PLAT- INUM- CORALIT UNITS) (00080)	SPE- CFIC CON- JUCT- ANCE (MICRO- MOS) (00095)	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)
1975	1230	2	--	10.0	--	25	--	--	977	--	8.2	4.6
1240	1100	2	--	7.5	--	34	--	--	912	--	8.2	4.4
1130	1130	2	--	9.0	12	--	--	--	1040	--	8.2	5.2
1100	1100	2	1861	11.0	--	6.6	--	--	1240	--	8.1	7.6
1230	1230	2	--	15.0	--	6.4	--	--	1220	--	8.3	4.8
1210	1210	2	--	19.0	6.9	--	--	--	1190	--	8.2	5.9
1200	1200	2	--	19.0	--	7.0	--	--	1200	--	8.2	5.8
1200	1200	2	--	16.0	7.3	--	--	--	1270	--	8.3	4.7
0940	0940	2	--	10.5	--	6.4	--	--	1250	--	8.2	6.2
1530	1530	2	--	22.0	--	4.0	--	--	1250	--	8.1	7.5
1600	1600	2	--	20.0	--	14	--	--	1030	--	7.8	11
0415	0415	2	--	13.0	8.0	--	--	--	1210	--	8.1	7.6
1240	1240	2	--	14.0	28	--	--	--	1020	--	8.2	5.0
1000	1000	2	--	21.0	--	7.4	--	--	1010	--	--	--
1530	1530	2	--	19.5	--	8.4	--	--	--	--	6.9	--
1000	1000	2	--	8.0	--	7.1	--	--	1080	--	--	--
1100	1100	2	--	7.0	--	8.1	--	--	1060	--	--	--
1330	1330	2	--	13.0	--	--	--	--	1140	--	--	--
1400	1400	2	--	14.0	--	2.9	--	--	1190	--	--	--
1400	1400	2	--	13.0	--	4.1	--	--	1160	--	--	--
1500	1500	2	--	11.0	--	5.3	--	--	1160	--	--	--
1600	1600	2	--	5.0	--	--	--	--	1160	--	--	--
1200	1200	2	--	5.0	--	6.0	--	--	1200	--	--	--
1200	1200	2	--	4.0	--	9.5	--	--	1040	--	8.0	8.4
1340	1340	2	--	4.0	--	9.8	20	5	1070	9	8.2	5.2

09306007 - PICEANCE CREEK BELOW RIO BLANCO, CO.

WATER QUALITY DATA

DATE	CYANIDE (CN) (MG/L) (00720)	DIS- SOL- VED (S) (MG/L) (00745)	HARD- NESS (CA+MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	SODIUM AD- SORP- TION RATIO (00931)	PERCENT SODIUM (00932)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
400... 1974	--	--	340	0	49	40	2.3	38	2.7	13	160
23... MAY	--	--	320	0	66	38	2.1	37	3.1	9.7	140
03...	--	--	380	0	74	47	2.5	38	3.4	12	180
17...	--	--	410	0	77	52	3.0	43	2.9	15	190
22...	--	--	410	0	76	53	3.0	42	4.3	17	180
31...	--	--	400	0	73	52	3.3	45	3.7	15	180
14...	--	--	390	0	76	49	3.1	44	3.4	17	180
21...	--	--	400	0	76	50	3.3	45	4.1	16	180
26...	--	--	420	0	74	56	3.2	44	3.5	16	190
02...	--	--	410	0	72	57	3.4	45	3.8	17	200
11...	--	--	340	0	73	39	2.6	41	5.7	16	190
20...	--	--	390	0	75	48	3.1	44	3.9	16	190
06...	--	--	350	0	69	42	2.6	41	3.4	13	170
13...	--	--	340	0	65	42	2.9	44	2.4	13	150
31...	--	--	320	--	51	47	3.2	46	4.3	15	150
04...	--	--	380	0	70	50	2.7	40	4.2	16	160
20...	--	--	340	0	63	44	2.6	41	3.2	13	150
07...	--	--	370	0	69	49	3.2	45	2.8	16	170
09...	--	--	350	0	69	43	3.5	48	3.1	17	170
14...	--	--	360	0	70	50	3.1	44	3.3	16	170
23...	--	--	360	0	68	46	3.0	44	3.5	16	170
31...	--	--	400	0	76	50	3.1	43	3.8	15	170
04...	--	--	360	0	75	42	3.2	46	3.3	16	160
16...	--	--	350	0	71	42	3.0	44	2.9	16	160
26...	--	--	330	0	58	45	2.9	44	2.4	13	150
04...	0.00	0.0									

09306007 - PICEANCE CREEK BELOW RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED LITHIUM (LI) (UG/L) (01139)	DIS- SOLVED NICKEL (SE) (UG/L) (01145)	DIS- SOLVED TANTUM (TI) (UG/L) (01150)	DIS- SOLVED ZIR- CONIUM (Z9) (UG/L) (01150)	DIS- SOLVED (SUM OF CONST- TUENTS) (MG/L) (70301)	DIS- SOLVED SOLIDS (TONS PER DAY) (70302)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (70303)	TOTAL OPHO PHOS- PHORUS (P) (MG/L) (70507)	DIS- SOLVED AMMONIA (NH4) (MG/L) (71345)
APR. 1974									
23...	--	--	--	--	625	43.5	.85	--	--
MAY									
03...	--	--	--	--	578	53.7	.79	--	--
17...	--	0	--	--	701	22.7	.95	--	--
22...	10	2	<8	<24	792	14.2	1.08	--	--
31...	10	1	--	--	786	13.6	1.07	--	--
JUNE									
14...	10	1	--	--	776	14.5	1.06	--	--
21...	10	1	--	--	764	14.4	1.04	--	--
26...	10	0	--	--	783	15.4	1.06	--	--
JULY									
02...	0	1	--	--	899	14.1	1.10	--	--
11...	0	1	--	--	829	9.04	1.13	--	--
20...	0	0	--	--	670	25.4	.91	--	--
AUG.									
03...	0	1	--	--	726	17.0	1.07	--	--
10...	0	2	--	--	674	51.0	.92	--	--
16...	0	2	--	--	640	12.8	.87	--	--
31...	0	1	--	--	--	--	--	--	--
SEP.									
20...	0	1	--	--	696	13.4	.95	--	--
27...	0	1	--	--	649	14.3	.88	--	--
OCT.									
04...	0	1	--	--	730	--	.99	--	--
09...	0	0	--	--	749	6.05	1.02	--	--
16...	0	0	--	--	738	8.31	1.00	--	--
23...	0	0	--	--	712	10.3	.98	--	--
31...	0	0	--	--	762	--	1.04	--	--
NOV.									
06...	0	0	--	--	739	12.0	1.01	--	--
20...	0	1	--	--	698	18.0	.95	--	--
DEC.									
04...	<10	1	--	--	662	17.5	.90	.03	.04

09306007 - PICEANCE CREEK BELOW RIO BLANCO, CO.

WATER QUALITY DATA

DATE	ALKA- LITY AS CAUO3 (MG/L) (00410)	BICAR- BONATE (PCO3) (MG/L) (00440)	CAR- BONATE (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS- SOLVED AMMONIA NITRO- GEN (N) (MG/L) (00608)	DIS- SOLVED NITRITE (N) (MG/L) (00613)	DIS- SOLVED NITRATE (N) (MG/L) (00618)	TOTAL KJEL- DAHL NITRO- GEN (N) (VS/L) (00625)	DIS- SOLVED NITRITE PLUS NITRATE (N) (MG/L) (00631)	DIS- SOLVED PHOS- PHATE (P04) (MG/L) (00650)	TOTAL PHOS- PHORUS (P) (MG/L) (00655)	DIS- SOLVED PHOS- PHORUS (P) (VS/L) (00671)
APR., 1974												
23...	374	456	0	--	--	--	--	--	.63	.06	--	.02
MAY												
03...	358	436	0	--	--	--	--	--	.70	.03	--	.01
17...	423	516	0	--	--	--	--	--	.56	.09	--	.03
22...	491	599	0	--	--	--	--	--	.28	.12	--	.04
31...	402	600	0	--	--	--	--	--	.15	.18	--	.06
JUNE												
14...	476	580	0	--	--	--	--	--	.08	.06	--	.02
21...	472	576	0	--	--	--	--	--	.03	.03	--	.01
26...	481	587	0	--	--	--	--	--	.04	.06	--	.02
JULY												
02...	506	617	0	--	--	--	--	--	.01	.00	--	.00
11...	481	587	0	--	--	--	--	--	2.5	1.1	--	.36
21...	362	441	0	--	--	--	--	--	.47	.12	--	.04
AUG.												
03...	488	595	0	--	--	--	--	--	.15	.06	--	.02
10...	408	497	0	--	--	--	--	--	.69	.12	--	.04
16...	381	465	--	--	--	--	--	--	.40	.03	--	.01
31...	--	--	--	--	--	--	--	--	.12	.03	--	.01
SEP.												
21...	428	522	--	--	--	--	--	--	.23	.06	--	.02
27...	412	502	--	--	--	--	--	--	.21	.03	--	.01
OCT.												
14...	440	537	--	--	--	--	--	--	.07	.00	--	.00
09...	462	563	--	--	--	--	--	--	.03	.03	--	.01
16...	449	548	--	--	--	--	--	--	.02	.00	--	.00
23...	445	542	--	--	--	--	--	--	.00	.00	--	.00
31...	472	563	--	--	--	--	--	--	.04	.09	--	.03
NOV.												
07...	472	576	--	--	--	--	--	--	.07	.09	--	.03
06...	430	524	--	--	--	--	--	--	.26	.03	--	.01
DEC.												
04...	424	517	0	0	.03	.00	.38	.30	.38	.06	.05	.02

03/75

PROCESS DATE

DISTRICT CODE OR

09306007 - PICEANCE CREEK BELOW RIO BLANCO. CO.

## WATER QUALITY DATA

DATE	DIS- SOLVED FLUO- RIDE (-) (UG/L) (00000)	DIS- SOLVED SILICA (SI02) (UG/L) (00000)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BARIUM (BA) (UG/L) (01005)	DIS- SOLVED PERYL- LUM (OP) (UG/L) (01010)	DIS- SOLVED PI SMUTH (BI) (UG/L) (01015)	DIS- SOLVED MORON (R) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CO) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	DIS- SOLVED CORALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)	DIS- SOLVED IRON (FE) (UG/L) (01045)
1974												
23...	1.3	15	--	--	--	--	--	--	--	--	--	110
24...	7	14	--	--	--	--	--	--	--	--	--	40
25...	9	17	2	--	--	--	--	--	--	--	--	40
26...	9	17	1	130	--	<11	200	0	--	<15	<4	300
27...	9	17	2	200	--	--	240	1	--	--	4	30
28...	1.0	15	1	200	--	--	250	0	--	--	2	40
29...	9	13	3	0	--	--	260	1	--	--	3	20
30...	9	16	2	<100	--	--	250	2	--	--	9	40
31...	8	14	5	<100	--	--	250	0	--	--	5	50
32...	8	17	4	<100	--	--	240	1	--	--	1	50
33...	7	15	3	0	--	--	260	1	--	--	12	150
34...	9	18	2	0	--	--	240	1	--	--	2	90
35...	9	17	3	0	--	--	200	<1	--	--	4	50
36...	6	15	2	100	--	--	220	<1	--	--	3	50
37...	9	16	3	100	--	--	240	1	--	--	3	70
38...	1.0	16	2	100	--	--	120	1	--	--	1	30
39...	1.1	15	2	0	--	--	160	<1	--	--	0	120
40...	1.1	17	2	0	--	--	260	<1	--	--	1	30
41...	1.1	17	3	<100	--	--	290	<1	--	--	6	60
42...	1.0	17	2	100	--	--	200	0	--	--	0	60
43...	1.2	16	1	0	--	--	290	0	--	--	0	80
44...	1.0	18	1	100	--	--	190	0	--	--	1	40
45...	1.0	16	2	<100	--	--	250	1	--	--	2	390
46...	1.0	15	4	<100	--	--	230	0	--	--	1	10
47...	1.1	15	3	<100	--	--	230	1	<10	--	1	10



09306007 - PICEANCE CREEK BELOW RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED LEAD (PP) (01049)	DIS- SOLVED MANGANESE (PP) (01056)	DIS- SOLVED BISMUTH (PP) (01060)	DIS- SOLVED NICKEL (NI) (01055)	DIS- SOLVED SILVER (AG) (01075)	DIS- SOLVED STRONTIUM (SR) (01080)	DIS- SOLVED VANADIUM (V) (01085)	DIS- SOLVED ZINC (Z) (01090)	DIS- SOLVED TIN (SN) (01100)	DIS- SOLVED ALUMINUM (AL) (01106)	DIS- SOLVED SODIUM (NA) (01120)	DIS- SOLVED GERMANIUM (GE) (01125)
APR. 1974	--	30	--	--	--	--	--	--	--	--	--	--
23.00	--	--	--	--	--	--	--	--	--	--	--	--
24.00	--	10	--	--	--	--	--	--	--	--	--	--
25.00	--	100	--	--	--	--	--	--	--	--	--	--
26.00	<16	210	6	<3	<2	1600	<8.0	10	<11	60	<8	<16
27.00	5	140	--	--	--	--	--	30	--	--	--	--
28.00	7	40	--	--	--	--	--	30	--	--	--	--
29.00	8	100	--	--	--	--	--	40	--	--	--	--
30.00	7	200	--	--	--	--	--	30	--	--	--	--
31.00	1	230	--	--	--	--	--	0	--	--	--	--
32.00	4	180	--	--	--	--	--	10	--	--	--	--
33.00	3	140	--	--	--	--	--	40	--	--	--	--
34.00	4	180	--	--	--	--	--	20	--	--	--	--
35.00	2	70	--	--	--	--	--	30	--	--	--	--
36.00	1	40	--	--	--	--	--	10	--	--	--	--
37.00	6	50	--	--	--	--	--	20	--	--	--	--
38.00	4	50	--	--	--	--	--	20	--	--	--	--
39.00	2	50	--	--	--	--	--	0	--	--	--	--
40.00	0	100	--	--	--	--	--	20	--	--	--	--
41.00	4	170	--	--	--	--	--	60	--	--	--	--
42.00	3	150	--	--	--	--	--	30	--	--	--	--
43.00	1	140	--	--	--	--	--	0	--	--	--	--
44.00	1	230	--	--	--	--	--	30	--	--	--	--
45.00	3	230	--	--	--	--	--	50	--	--	--	--
46.00	2	110	--	--	--	--	--	10	--	--	--	--
47.00	1	70	--	--	--	--	--	0	--	--	--	--

09306007 - PICEANCE CREEK BELOW RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED NITRATE (MG/L) (71851)	DIS- SOLVED NITRITE (MG/L) (71856)	DIS- SOLVED MERCURY (HG) (71890)	ELEV. OF LAND SURFACE DATUM (FT.) 430VE MSL) (72000)
APR. 1974				
23...	--	--	--	5366
MAY				
03...	--	--	--	5366
17...	--	--	.0	5366
22...	--	--	.0	5366
31...	--	--	.0	5366
JUNE				
14...	--	--	.0	5366
21...	--	--	.0	5366
26...	--	--	.0	5366
JULY				
02...	--	--	.0	5366
11...	--	--	.0	5366
20...	--	--	.0	5366
AUG.				
03...	--	--	.0	5366
10...	--	--	.0	5366
16...	--	--	.0	5366
31...	--	--	.8	5366
SEP.				
20...	--	--	.0	5366
27...	--	--	.1	5366
OCT.				
04...	--	--	.0	5366
09...	--	--	.0	5366
16...	--	--	.0	5366
23...	--	--	.0	5366
31...	--	--	.0	5366
NOV.				
06...	--	--	.0	5366
20...	--	--	.0	5366
DEC.				
04...	1.7	.00	4.1	5366



WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (000008)	TEMPER- ATURE (DEG C) (00010)	DIS- CHARGE (CFS) (00060)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00061)	TUR- BID- IFY (JFU) (00070)	COLOR (PLAT- INUM- CORALIT UNITS) (00060)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHO) (00095)	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (M3/L) (00340)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (M3/L) (00405)
APR 1974												
23...	1230	2	--	10.0	--	25	--	--	977	--	8.2	4.6
MAY												
03...	1100	2	--	7.5	--	34	--	--	912	--	8.2	4.4
17...	1100	2	--	9.0	12	--	--	--	1080	--	8.2	5.2
22...	1100	2	1281	11.0	--	6.6	--	--	1240	--	8.1	7.6
31...	1230	2	--	15.0	--	6.4	--	--	1220	--	8.3	4.8
JUNE												
14...	1210	2	--	19.0	6.9	--	--	--	1190	--	8.2	5.9
21...	--	2	--	19.0	--	7.0	--	--	1200	--	8.2	5.8
26...	1020	2	--	15.0	7.3	--	--	--	1270	--	8.3	4.7
JULY												
02...	0900	2	--	10.5	--	6.4	--	--	1250	--	8.2	6.2
11...	1530	2	--	22.0	--	4.0	--	--	1250	--	8.1	7.5
20...	1445	2	--	20.0	--	14	--	--	1030	--	7.8	11
AUG												
03...	0915	2	--	13.0	8.0	--	--	--	1210	--	8.1	7.5
10...	1245	2	--	14.0	28	--	--	--	1020	--	8.2	5.0
17...	1600	2	--	21.0	--	7.4	--	--	1010	--	--	--
31...	1530	2	--	19.5	--	8.4	--	--	--	--	6.9	--
SEP												
20...	1000	2	--	8.0	--	7.1	--	--	1090	--	--	--
27...	1100	2	--	7.0	--	8.1	--	--	1060	--	--	--
OCT												
04...	1330	2	--	13.0	--	--	--	--	1140	--	--	--
09...	1340	2	--	14.0	--	2.9	--	--	1190	--	--	--
16...	1420	2	--	13.0	--	4.1	--	--	1160	--	--	--
23...	1300	2	--	11.0	--	5.3	--	--	1160	--	--	--
31...	1000	2	--	5.0	--	--	--	--	1130	--	--	--
NOV												
06...	1600	2	--	5.0	--	6.0	--	--	1200	--	--	--
20...	1200	2	--	4.0	--	9.5	--	--	1090	--	8.0	8.4
DEC												
04...	1340	2	751700	4.0	--	9.8	20	5	1070	9	8.2	5.2
18...	0910	2	--	.0	--	11	20	2	1200	--	8.4	3.4
31...	1200	2	--	1.0	--	7.8	6	3	1100	--	8.3	4.4
JAN 1975												
19...	--	2	--	1.0	--	9.5	30	5	1200	--	8.1	7.0
FEB												
03...	1155	2	--	1.0	--	12	10	3	1120	--	9.0	.9

WATER QUALITY DATA

DATE	ALKALINITY AS CaCO <sub>3</sub> (MG/L) (00410)	BICARBONATE (MG/L) (00440)	CARBONATE (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS-SOLVED AMMONIA NITRO-GEN (N) (MG/L) (00660)	DIS-SOLVED NITRITE (N) (MG/L) (00613)	DIS-SOLVED NITRATE (N) (MG/L) (00618)	TOTAL KJEL-Dahl NITRO-GEN (N) (MG/L) (00625)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L) (00631)	DIS-SOLVED ORTHO-PHOS-PHATE (P04) (MG/L) (00660)	TOTAL PHOS-PHORUS (P) (MG/L) (00665)	DIS-SOLVED ORTHO-PHOS-PHATE (P) (MG/L) (00671)
JAN. 1974												
12.00	374	456	0	--	--	--	--	--	.63	.05	--	.02
13.00	358	436	0	--	--	--	--	--	.70	.03	--	.01
14.00	423	516	0	--	--	--	--	--	.56	.09	--	.03
15.00	491	529	0	--	--	--	--	--	.28	.12	--	.04
16.00	492	609	0	--	--	--	--	--	.15	.18	--	.06
17.00	476	520	0	--	--	--	--	--	.08	.05	--	.02
18.00	472	576	0	--	--	--	--	--	.03	.03	--	.01
19.00	461	587	0	--	--	--	--	--	.04	.06	--	.02
20.00	505	617	0	--	--	--	--	--	.01	.00	--	.00
21.00	491	587	0	--	--	--	--	--	2.5	1.1	--	.36
22.00	362	441	0	--	--	--	--	--	.47	.12	--	.04
AUG.												
02.00	498	595	0	--	--	--	--	--	.15	.06	--	.02
03.00	408	497	0	--	--	--	--	--	.49	.12	--	.04
04.00	391	465	--	--	--	--	--	--	.40	.03	--	.01
05.00	--	--	--	--	--	--	--	--	.12	.03	--	.01
06.00	428	522	--	--	--	--	--	--	.23	.06	--	.02
07.00	412	502	--	--	--	--	--	--	.21	.03	--	.01
08.00	440	537	--	--	--	--	--	--	.07	.00	--	.00
09.00	462	563	--	--	--	--	--	--	.03	.03	--	.01
10.00	449	548	--	--	--	--	--	--	.02	.00	--	.00
11.00	445	542	--	--	--	--	--	--	.00	.00	--	.00
12.00	478	583	--	--	--	--	--	--	.04	.09	--	.03
NOV.												
01.00	472	576	--	--	--	--	--	--	.07	.09	--	.03
02.00	439	524	--	--	--	--	--	--	.26	.03	--	.01
03.00	424	517	0	0	.03	.00	.38	.30	.38	.06	.05	.02
04.00	442	539	0	1	.04	.02	.33	.33	.35	.09	.09	.03
05.00	454	554	0	1	.08	.00	.43	.25	.43	.15	.05	.05
JAN. 1975												
15.00	453	552	0	8	.13	.01	.56	.48	.57	.06	.08	.02
FEB.												
03.00	461	562	0	6	.06	.01	.32	.61	.33	.12	.16	.04

WATER QUALITY DATA

DATE	CYANIDE (CN) (MG/L) (00720)	DIS- SOL- VED (MG/L) (00745)	HARD- NESS (CA+MG) (MG/L) (00900)	NOV- CAP- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOLVED MAG- NESIUM (MG) (MG/L) (00925)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)	SODIUM AD- SORP- TION RATIO (00931)	PERCENT SODIUM (00932)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
APR 23 1974	--	--	340	0	69	40	96	2.3	38	2.7	13	150
MAY 03 1974	--	--	320	0	66	38	88	2.1	37	3.1	9.7	140
MAY 17 1974	--	--	350	0	74	47	110	2.5	38	3.4	12	150
MAY 22 1974	--	--	410	0	77	52	140	3.0	43	2.9	15	190
MAY 31 1974	--	--	410	0	76	53	140	3.0	42	4.3	17	180
JUNE 14 1974	--	--	400	0	73	52	150	3.3	45	3.7	15	180
JUNE 21 1974	--	--	390	0	75	49	140	3.1	44	3.4	17	180
JUNE 28 1974	--	--	400	0	76	50	150	3.3	45	4.1	16	180
JULY 02 1974	--	--	420	0	74	56	150	3.2	44	3.5	16	190
JULY 11 1974	--	--	410	0	72	57	160	3.4	45	3.8	17	200
JULY 20 1974	--	--	340	0	73	39	110	2.6	41	5.7	16	190
AUG 06 1974	--	--	390	0	75	48	140	3.1	44	3.9	16	130
AUG 09 1974	--	--	350	0	69	42	110	2.6	41	3.4	13	170
AUG 16 1974	--	--	340	0	65	42	120	2.9	44	2.4	13	150
AUG 31 1974	--	--	320	--	51	47	130	3.2	46	4.3	15	150
SEP 20 1974	--	--	380	0	70	50	120	2.7	40	4.2	16	150
SEP 27 1974	--	--	340	0	63	44	110	2.6	41	3.2	13	150
OCT 04 1974	--	--	370	0	69	49	140	3.2	45	2.8	16	170
OCT 07 1974	--	--	350	0	69	43	150	3.5	48	3.1	17	170
OCT 16 1974	--	--	380	0	70	50	140	3.1	44	3.3	15	170
OCT 23 1974	--	--	360	0	68	46	130	3.0	44	3.5	16	170
OCT 31 1974	--	--	400	0	76	50	140	3.1	43	3.8	15	170
NOV 05 1974	--	--	350	0	75	42	140	3.2	46	3.8	16	160
NOV 21 1974	--	--	350	0	71	42	130	3.0	44	2.9	16	150
DEC 06 1974	.00	.0	330	0	58	45	120	2.9	44	2.4	13	150
DEC 18 1974	.00	.5	340	0	76	48	130	2.9	42	2.9	15	170
DEC 31 1974	.00	.9	360	0	73	43	120	2.8	42	2.9	14	150
JAN 15 1975	.00	.0	370	0	74	46	130	2.9	43	3.4	16	160
FEB 03 1975	.00	.1	370	0	72	45	130	2.9	43	2.6	19	170

## WATER QUALITY DATA

DATE	DIS- SOLVED FLUO- RIDE (F)	DIS- SOLVED SILICA (SiO2)	DIS- SOLVED ARSENIC (AS)	DIS- SOLVED PARATHION (PA)	DIS- SOLVED LITHIUM (LI)	DIS- SOLVED MISOLITH (BI)	DIS- SOLVED BORON (B)	DIS- SOLVED VIOL (CO)	DIS- SOLVED C-HO- MIUM (CH)	DIS- SOLVED CORAL (CO)	DIS- SOLVED COPPER (CU)	DIS- SOLVED IRON (FE)
APR., 1974												
23...	1.3	15	--	--	--	--	--	--	--	--	--	110
MAY												
16...	.7	14	--	--	--	--	--	--	--	--	--	40
17...	.8	17	2	--	--	--	--	--	--	--	--	40
22...	.9	17	1	130	--	<11	200	0	--	<15	<4	300
31...	.9	17	2	200	--	--	240	1	--	--	4	30
JUNE												
14...	1.3	15	1	200	--	--	250	0	--	--	2	40
24...	.9	13	3	0	--	--	260	1	--	--	3	20
25...	.9	15	2	<100	--	--	250	2	--	--	9	40
JULY												
14...	.3	14	5	<100	--	--	250	0	--	--	5	50
17...	.2	17	4	<100	--	--	280	1	--	--	1	50
20...	.7	15	3	0	--	--	260	1	--	--	12	150
AUG.												
14...	.9	16	2	0	--	--	240	1	--	--	2	90
17...	.8	17	3	0	--	--	200	<1	--	--	4	50
18...	.6	16	2	100	--	--	220	<1	--	--	3	50
23...	.9	16	3	100	--	--	240	1	--	--	3	70
SEP.												
20...	1.0	16	2	100	--	--	120	1	--	--	1	30
27...	1.1	15	2	0	--	--	160	<1	--	--	0	120
OCT.												
04...	1.1	17	2	0	--	--	260	<1	--	--	1	30
09...	1.1	17	3	<100	--	--	250	<1	--	--	6	60
15...	1.0	17	2	100	--	--	200	0	--	--	0	60
23...	1.2	16	1	0	--	--	280	0	--	--	0	80
31...	1.0	18	1	100	--	--	190	0	--	--	1	40
NOV.												
05...	1.0	16	2	<100	--	--	250	1	--	--	2	390
20...	1.0	15	4	<100	--	--	230	0	--	--	1	10
DEC.												
04...	1.1	15	3	130	<1	<5	130	<15	<5	<5	1	300
18...	1.0	15.4	3	100	--	--	220	0	0	--	1	10
31...	1.1	15	1	100	--	--	210	0	0	--	0	10
JAN., 1975												
15...	1.2	17	1	0	--	--	240	2	10	--	8	20
FEB.												
03...	1.1	16	5	100	--	--	190	0	0	--	1	20

WATER QUALITY DATA

DATE	DIS- SOLVED LEAD (Pb) (UG/L) (01049)	DIS- SOLVED MANG- NESE (Mn) (UG/L) (01055)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01050)	DIS- SOLVED NICKEL (NI) (UG/L) (01065)	DIS- SOLVED SILVER (AG) (UG/L) (01075)	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01080)	DIS- SOLVED VANAD- IUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)	DIS- SOLVED TIN (SN) (UG/L) (01100)	DIS- SOLVED ALUM- INIUM (AL) (UG/L) (01106)	DIS- SOLVED GALLIUM (GA) (UG/L) (01120)	DIS- SOLVED GER- MANIUM (GE) (UG/L) (01125)
APR., 1974												
25...	--	30	--	--	--	--	--	--	--	--	--	--
MAY												
03...	--	10	--	--	--	--	--	--	--	--	--	--
17...	--	100	--	--	--	--	--	--	--	--	--	--
22...	<15	210	6	<8	<2	1600	<8.0	10	<11	60	<8	<16
21...	5	140	--	--	--	--	--	30	--	--	--	--
JUNE												
14...	7	40	--	--	--	--	--	30	--	--	--	--
21...	8	180	--	--	--	--	--	40	--	--	--	--
25...	7	200	--	--	--	--	--	30	--	--	--	--
JULY												
02...	1	230	--	--	--	--	--	0	--	--	--	--
11...	4	180	--	--	--	--	--	10	--	--	--	--
20...	3	140	--	--	--	--	--	40	--	--	--	--
AUG.												
03...	4	180	--	--	--	--	--	20	--	--	--	--
10...	2	70	--	--	--	--	--	30	--	--	--	--
15...	1	40	--	--	--	--	--	10	--	--	--	--
31...	6	50	--	--	--	--	--	20	--	--	--	--
SEP.												
26...	4	50	--	--	--	--	--	20	--	--	--	--
27...	2	50	--	--	--	--	--	0	--	--	--	--
OCT.												
04...	0	100	--	--	--	--	--	20	--	--	--	--
09...	4	170	--	--	--	--	--	60	--	--	--	--
15...	3	150	--	--	--	--	--	30	--	--	--	--
23...	1	140	--	--	--	--	--	0	--	--	--	--
31...	1	230	--	--	--	--	--	30	--	--	--	--
NOV.												
05...	3	230	--	--	--	--	--	50	--	--	--	--
20...	2	110	--	--	--	--	--	10	--	--	--	--
DEC.												
04...	<5	100	7	<4	0	1800	<3.0	<15	<5	450	<3	<5
15...	1	80	--	--	--	--	--	0	--	--	--	--
31...	0	50	--	--	--	--	--	10	--	--	--	--
JAN., 1975												
15...	7	50	--	--	--	--	--	40	--	--	--	--
FEB.												
03...	6	67	--	--	--	--	--	20	--	--	--	--



WATER QUALITY DATA

DATE	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED SILICA (SE) (UG/L) (01145)	DIS- SOLVED TANTUM (TI) (UG/L) (01150)	DIS- SOLVED ZINC (ZR) (UG/L) (01160)	DIS- SOLVED (SU-OF CONSTITUENTS) (MG/L) (70302)	DIS- SOLVED SOLIDS (TONS PER DAY) (70302)	DIS- SOLVED SOLIDS (TONS AC-FT) (70303)	TOTAL ORTHO PHOS- PHORUS (P) (MG/L) (70507)	DIS- SOLVED AMMONIA (NH4) (MG/L) (71845)
APR. 1974									
25...	--	--	--	--	625	43.5	.85	--	--
MAY									
03...	--	--	--	--	578	53.7	.79	--	--
17...	--	--	--	--	701	22.7	.95	--	--
22...	10	2	48	<24	792	14.2	1.08	--	--
31...	10	1	--	--	786	13.6	1.07	--	--
JUNE									
14...	10	1	--	--	776	14.5	1.06	--	--
21...	10	1	--	--	784	14.4	1.04	--	--
25...	10	0	--	--	783	15.4	1.06	--	--
JULY									
02...	0	1	--	--	809	14.1	1.10	--	--
11...	0	1	--	--	829	9.04	1.13	--	--
20...	0	0	--	--	670	26.4	.91	--	--
AUG.									
03...	0	1	--	--	786	17.0	1.07	--	--
10...	0	2	--	--	674	51.0	.92	--	--
15...	0	2	--	--	640	12.8	.87	--	--
31...	0	1	--	--	--	--	--	--	--
SEP.									
20...	0	1	--	--	696	13.4	.95	--	--
27...	0	1	--	--	649	14.3	.83	--	--
OCT.									
04...	0	1	--	--	730	--	.99	--	--
09...	0	0	--	--	749	6.05	1.02	--	--
15...	0	0	--	--	738	8.31	1.00	--	--
23...	0	0	--	--	718	10.3	.98	--	--
31...	0	0	--	--	762	--	1.04	--	--
NOV.									
06...	0	0	--	--	739	12.0	1.01	--	--
20...	0	1	--	--	698	18.0	.95	--	--
DEC.									
04...	8	1	25	<10	664	17.6	.90	.03	.04
12...	20	2	--	--	715	21.2	.97	.05	.05
31...	20	1	--	--	697	14.8	.95	.05	.10
JAN. 1975									
15...	20	1	--	--	723	18.6	.98	.05	.17
FEB.									
03...	20	1	--	--	735	24.4	1.00	.04	.08

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WATER QUALITY DATA

DATE	DIS- SOLVED NITRATE (MG/L) (71851)	DIS- SOLVED NITRITE (MG/L) (71855)	DIS- SOLVED MERCURY (HG) (71890)	ELFV. OF LAND SURFACE DATUM (FT. ABOVE MSL) (72000)
APR., 1974				
23...	--	--	--	6366
MAY				
03...	--	--	--	6366
17...	--	--	.0	6366
22...	--	--	.0	6366
31...	--	--	.0	6366
JUNE				
14...	--	--	.0	6366
21...	--	--	.0	6366
26...	--	--	.0	6366
JULY				
02...	--	--	.0	6366
11...	--	--	.0	6366
20...	--	--	.0	6366
AUG.				
03...	--	--	.0	6366
10...	--	--	.0	6366
16...	--	--	.0	6366
31...	--	--	.8	6366
SEP.				
20...	--	--	.0	6366
27...	--	--	.1	6366
OCT.				
04...	--	--	.0	6366
09...	--	--	.0	6366
16...	--	--	.0	6366
23...	--	--	.0	6366
31...	--	--	.0	6366
NOV.				
05...	--	--	.0	6366
20...	--	--	.0	6366
DEC.				
06...	1.7	.00	<.1	6366
18...	1.5	.07	<.1	6366
31...	1.9	.00	.0	6366
JAN., 1975				
15...	2.5	.03	.1	6366
FEB.				
03...	1.4	.03	.1	6366

WATER QUALITY DATA

DATE	TIME	TYPE	DEPTH (FT) (00003)	TEMPER- ATURE (DEG C) (00010)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00001)	TUR- BID- ITY (JTU) (00070)	COLOR (PLAT- INUM- CORALIT UNITS) (00080)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS) (00005)	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	PH (UNITS) (00400)	CARBON DIOXIDE (CC2) (MG/L) (00405)	ALKAL- INITY AS CACO3 (MG/L) (00410)
SEP., 1974												
12...	1300	2	--	8.5	2.4	--	--	1420	--	--	--	427
20...	1115	2	--	9.5	2.7	--	--	1400	--	--	--	427
27...	1015	2	--	8.0	2.3	--	--	1410	--	--	--	419
OCT.												
04...	1200	2	--	10.0	--	--	--	1350	--	--	--	387
09...	1230	2	--	10.5	2.1	--	--	1370	--	--	--	404
15...	1200	2	--	8.0	1.9	--	--	1360	--	--	--	396
23...	1230	2	--	9.0	1.9	--	--	1400	--	--	--	422
30...	1400	2	--	8.0	1.3	--	--	1370	--	--	--	421
NOV.												
06...	1130	2	--	8.0	2.1	--	--	1460	--	--	--	436
20...	0730	2	--	6.0	2.4	--	--	1750	--	--	--	641
DEC.												
04...	1100	2	04	5.0	2.4	30	3	1360	5	8.3	3.9	403
17...	0615	2	--	1.0	2.1	10	3	1300	--	--	--	472

WATER QUALITY DATA

DATE	BICARBONATE (MG/L) (00440)	CARBONATE (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS-SOLVED AMMONIA NITROGEN (MG/L) (00609)	DIS-SOLVED NITRITE (N) (MG/L) (00613)	DIS-SOLVED NITRATE (N) (MG/L) (00518)	TOTAL KJEL DAHL NITROGEN (N) (MG/L) (00625)	DIS-SOLVED NITRITE PLUS NITRATE (N) (MG/L) (00631)	DIS-SOLVED ORTHO-PHOSPHATE (PC4) (MG/L) (00660)	TOTAL PHOSPHORUS (P) (MG/L) (00665)	DIS-SOLVED ORTHO-PHOSPHORUS (P) (MG/L) (00671)	CYANIDE (CN) (MG/L) (00720)
SEP. 1974												
12.00	520	--	--	--	--	--	--	1.5	.03	--	.01	--
20.00	520	--	--	--	--	--	--	1.5	.03	--	.01	--
27.00	511	--	--	--	--	--	--	1.6	.03	--	.01	--
001.												
04.00	472	--	--	--	--	--	--	1.5	.06	--	.02	--
05.00	492	--	--	--	--	--	--	1.4	.03	--	.01	--
14.00	483	--	--	--	--	--	--	1.6	.03	--	.01	--
23.00	514	--	--	--	--	--	--	1.5	.00	--	.00	--
30.00	513	--	--	--	--	--	--	1.6	.03	--	.01	--
NOV.												
04.00	531	--	--	--	--	--	--	1.7	.09	--	.03	--
20.00	702	--	--	--	--	--	--	1.6	.03	--	.01	--
DEC.												
10.00	491	0	2	.06	.00	1.7	.22	1.7	.03	.01	.01	.00
17.00	575	0	1	.07	.00	--	.32	1.7	.03	--	.01	.00

WATER QUALITY DATA

DATE	DIS- SOL- VED FIVE FEET (%) (MG/L) (00746)	HARD- NESS (CA+MG) (MG/L) (00900)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED CAL- CIUM (CA) (MG/L) (00915)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L) (00925)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)	SODIUM AD- SORP- TION RATIO (00931)	PERCENT SODIUM (00932)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)
SEP.. 1974												
12...	--	530	110	85	78	130	2.5	35	2.5	8.1	370	.2
20...	--	570	150	95	82	120	2.2	31	2.5	7.8	370	.3
27...	--	550	150	95	76	120	2.2	32	2.1	6.4	360	.2
04...	--	460	75	73	68	130	2.5	38	2.0	4.5	320	.2
05...	--	560	150	98	75	120	2.2	32	1.6	6.3	380	.2
16...	--	520	130	96	69	120	2.3	33	1.9	6.0	360	.2
23...	--	530	100	95	70	120	2.3	33	1.9	6.6	350	.3
31...	--	550	130	99	74	120	2.2	32	2.3	6.1	340	.3
07...	--	560	120	99	75	130	2.4	34	2.0	6.9	350	.4
10...	--	490	0	89	64	250	4.9	53	2.4	16	350	3.3
DEC.												
16...	.6	550	150	99	75	120	2.2	32	1.1	6.5	360	.2
17...	.2	560	85	96	77	130	2.4	34	1.4	11	340	1.2



WATER QUALITY DATA

DATE	DIS- SOLVED SILICA (SI02) (UG/L) (01000)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BARIUM (BA) (UG/L) (01005)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	DIS- SOLVED COPPER (CU) (UG/L) (01040)	DIS- SOLVED IRON (FE) (UG/L) (01046)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED MANG- ANESE (MN) (UG/L) (01056)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
SEP. 1974											
12...	17	1	0	90	7	--	5	50	2	0	10
15...	15	1	0	70	2	--	8	130	2	10	20
26...	17	1	0	70	<1	--	1	40	2	0	10
OCT.											
04...	16	1	0	110	0	--	1	20	1	0	20
09...	15	1	<100	100	<1	--	0	50	2	10	40
16...	16	1	<100	50	0	--	0	50	2	0	20
23...	17	1	0	110	0	--	0	20	1	0	20
30...	17	0	<100	30	0	--	0	20	2	0	30
NOV.											
06...	14	1	<100	120	3	--	2	620	2	20	90
20...	16	4	<100	530	0	--	0	20	2	0	370
DEC.											
04...	15	1	<100	90	1	<10	5	10	5	20	30
17...	15	2	100	260	1	<10	1	10	1	0	20

WATER QUALITY DATA

DATE	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED SELE- NIUM (SE) (UG/L) (01145)	DIS- SOLVED SOLIDS (SUM OF CONSTIT- TUENTS) (MG/L) (70301)	DIS- SOLVED SOLIDS (TONS PER DAY) (70302)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (70303)	TOTAL CRTHO PHOS- PHORUS (P) (MG/L) (70507)	DIS- SOLVED AMMONIA (NH4) (MG/L) (71846)	TOTAL NITRATE (NO3) (MG/L) (71850)	DIS- SOLVED NITRATE (NO3) (MG/L) (71851)	DIS- SOLVED NITRITE (NO2) (MG/L) (71856)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)
SEP., 1974											
12...	0	1	954	6.36	1.30	--	--	--	--	--	.0
20...	0	1	956	7.12	1.30	--	--	--	--	--	.0
27...	0	1	936	5.99	1.27	--	--	--	--	--	.0
OCT.											
01...	0	1	855	--	1.18	--	--	--	--	--	.0
09...	0	1	946	5.41	1.29	--	--	--	--	--	.0
16...	0	0	915	4.92	1.24	--	--	--	--	--	.0
23...	0	1	921	4.55	1.25	--	--	--	--	--	.0
30...	0	1	919	3.25	1.25	--	--	--	--	--	.0
NOV.											
06...	0	1	950	5.39	1.29	--	--	--	--	--	.0
20...	40	2	1160	7.70	1.58	--	--	--	--	--	.0
DEC.											
04...	<10	1	927	6.01	1.26	.04	.08	--	7.5	.00	<.1
17...	20	1	963	5.46	1.31	.03	.09	7.5	--	.00	<.1

WATER QUALITY DATA

DATE	TIME	TYPE	DEPTH (FT) (00003)	TEMPER- ATURE (DEG C) (00010)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00051)	TUR- BID- ITY (JTU) (00070)	COLOR (PLAT- INUM- CORALI UNITS) (00080)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MOS) (00095)	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)	ALKA- LITY AS CAO3 (MG/L) (00410)
SEP., 1974												
12...	1300	2	--	8.5	2.4	--	--	1420	--	--	--	427
20...	1115	2	--	9.3	2.7	--	--	1400	--	--	--	427
27...	1015	2	--	8.0	2.3	--	--	1410	--	--	--	419
OCT.												
04...	1300	2	--	10.0	--	--	--	1350	--	--	--	387
09...	1230	2	--	10.5	2.1	--	--	1370	--	--	--	404
16...	1200	2	--	8.0	1.9	--	--	1360	--	--	--	396
23...	1130	2	--	9.0	1.8	--	--	1400	--	--	--	422
30...	1400	2	--	8.0	1.3	--	--	1370	--	--	--	421
NOV.												
05...	1130	2	--	8.0	2.1	--	--	1460	--	--	--	436
29...	0930	2	--	6.0	2.4	--	--	1750	--	--	--	641
DEC.												
14...	1100	2	04	5.0	2.4	30	3	1360	5	8.3	3.9	403
27...	0815	2	--	1.0	2.1	10	3	1200	--	8.4	3.7	472
30...	1315	2	--	6.0	2.0	3	3	750	--	8.2	5.0	405
JAN., 1975												
15...	--	2	--	4.5	2.3	8	5	1400	--	7.2	51	418
FEB.												
29...	1030	2	--	6.0	1.7	5	3	1400	--	8.8	1.3	426

WATER QUALITY DATA

DATE	BICARBONATE (HCO3) (MG/L) (00440)	CARBONATE (CO3) (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS-SOLVED AMMONIA NITROGEN (N) (MG/L) (00508)	DIS-SOLVED NITRATE (N) (MG/L) (00613)	DIS-SOLVED NITRATE (N) (MG/L) (00618)	TOTAL KJELDAHL NITROGEN (N) (MG/L) (00625)	DIS-SOLVED NITRATE PLUS NITRATE (N) (MG/L) (00631)	DIS-SOLVED ORTHOPHOSPHATE (PO4) (MG/L) (00650)	TOTAL PHOSPHORUS (P) (MG/L) (00665)	DIS-SOLVED ORTHOPHOSPHORUS (PO4) (MG/L) (00671)	CYANIDE (CN) (MG/L) (00720)
SEP., 1974												
12.00	520	--	--	--	--	--	--	1.5	.03	--	.01	--
20.00	520	--	--	--	--	--	--	1.5	.03	--	.01	--
27.00	511	--	--	--	--	--	--	1.6	.03	--	.01	--
OCT.												
04.00	472	--	--	--	--	--	--	1.5	.06	--	.02	--
09.00	492	--	--	--	--	--	--	1.4	.03	--	.01	--
16.00	483	--	--	--	--	--	--	1.6	.03	--	.01	--
23.00	514	--	--	--	--	--	--	1.5	.00	--	.00	--
30.00	513	--	--	--	--	--	--	1.6	.03	--	.01	--
NOV.												
05.00	531	--	--	--	--	--	--	1.7	.09	--	.03	--
20.00	732	--	--	--	--	--	--	1.6	.03	--	.01	--
DEC.												
04.00	491	0	2	.06	.00	1.7	.22	1.7	.03	.01	.01	.00
17.00	575	0	1	.07	.00	1.7	.32	1.7	.03	.01	.01	.00
30.00	494	0	1	.09	.00	1.8	.14	1.8	.15	.05	.05	.00
JAN., 1975												
15.00	510	0	7	.03	.01	1.9	.40	1.8	.03	.02	.01	.00
FEB.												
03.00	519	0	9	.06	.01	1.9	.45	1.9	.12	.13	.04	.01

WATER QUALITY DATA

DATE	DIS- SOL- VED (%)	HARD- NESS (CAL/MG) (MG/L)	NON- CAR- BONATE HARD- NESS (MG/L)	DIS- SOLVED CAL- CIUM (MG/L)	DIS- SOLVED MAG- NE- SIUM (MG/L)	DIS- SOLVED SODIUM (MG/L)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	DIS- SOLVED PO- TAS- SIUM (%)	DIS- SOLVED CHLO- RIDE (CL) (MG/L)	DIS- SOLVED SULFATE (SO4) (MG/L)	DIS- SOLVED FLUO- RIDE (F) (MG/L)
SEP. 1974												
12.00	--	530	110	85	78	130	2.5	35	2.5	8.1	370	.2
25.00	--	570	150	95	82	120	2.2	31	2.5	7.3	370	.3
27.00	--	550	130	95	76	120	2.2	32	2.1	6.4	360	.3
OCT.												
04.00	--	460	75	73	68	130	2.6	38	2.0	6.5	330	.2
09.00	--	560	150	96	76	120	2.2	32	1.6	6.3	380	.2
16.00	--	520	130	96	69	120	2.3	33	1.9	6.0	360	.2
23.00	--	530	100	95	70	120	2.3	33	1.9	6.6	350	.3
30.00	--	550	130	99	74	120	2.2	32	2.3	6.1	340	.3
NOV.												
16.00	--	550	120	99	75	130	2.4	34	2.0	6.9	350	.6
20.00	--	450	0	89	64	250	4.9	53	2.4	16	330	3.3
DEC.												
04.00	.0	560	150	99	75	120	2.2	32	1.1	6.5	340	.2
17.00	.2	560	85	96	77	130	2.4	34	1.4	11	340	1.2
30.00	.7	530	130	97	71	120	2.3	33	2.0	7.6	370	.2
JAN. 1975												
15.00	.2	550	130	93	76	120	2.2	32	1.7	6.7	320	.2
FEB.												
03.00	.1	570	140	98	78	120	2.2	32	1.6	7.0	370	.4

WATER QUALITY DATA

DATE	DIS- SOLVED SILICA (SI02) (UG/L) (00955)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BARIUM (BA) (UG/L) (01005)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CALCIUM (CA) (UG/L) (01025)	DIS- SOLVED CHROMIUM (CR) (UG/L) (01020)	DIS- SOLVED COPPER (CU) (UG/L) (01040)	DIS- SOLVED IRON (FE) (UG/L) (01045)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED MANGANESE (MN) (UG/L) (01055)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)
SER. 1974											
12...	17	1	0	90	7	--	5	50	2	0	10
15...	15	1	0	70	2	--	8	130	2	10	20
27...	17	1	0	70	<1	--	1	40	2	0	10
OCT.											
04...	15	1	0	110	0	--	1	20	1	0	20
09...	15	1	<100	100	<1	--	0	50	2	10	40
16...	16	1	<100	50	0	--	0	50	2	0	20
23...	17	1	0	110	0	--	0	20	1	0	20
25...	17	0	<100	30	0	--	0	20	2	0	30
NOV.											
05...	16	1	<100	120	3	--	2	620	3	20	90
20...	16	4	<100	520	0	--	0	20	2	0	370
DEC.											
04...	15	1	<100	90	1	<10	5	10	5	20	30
17...	15	2	100	260	1	<10	1	10	1	0	20
30...	15	0	<100	80	0	0	1	20	2	0	20
JAN. 1975											
15...	15	1	100	120	1	10	3	10	7	10	20
FEB.											
03...	16	3	<100	70	1	0	8	10	6	40	20



WATER QUALITY DATA

DATE	DIS- SOLVED LITHIUM (LI) (01130)	DIS- SOLVED SELE- NIUM (SE) (01145)	DIS- SOLVED (50% OF CONSTI- TUENTS) (01341)	DIS- SOLVED SOLIDS (TONS PER DAY) (70302)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (70303)	TOTAL ORTHO P-OS- PHORUS (P) (05057)	DIS- SOLVED AMMONIA (NH4) (05046)	TOTAL NITRATE (NO3) (05050)	DIS- SOLVED NITRATE (NO3) (05051)	DIS- SOLVED NITRITE (NO2) (05056)	DIS- SOLVED MERCURY (HG) (05061)
SEP., 1974											
12...	0	1	954	6.36	1.30	--	--	--	--	--	.0
20...	0	1	956	7.12	1.30	--	--	--	--	--	.0
27...	0	1	936	5.99	1.27	--	--	--	--	--	.0
OCT.											
06...	0	1	865	--	1.18	--	--	--	--	--	.0
09...	0	1	946	5.41	1.29	--	--	--	--	--	.0
16...	0	0	915	4.92	1.24	--	--	--	--	--	.0
23...	0	1	921	4.55	1.25	--	--	--	--	--	.0
20...	0	1	919	3.25	1.25	--	--	--	--	--	.0
NOV.											
06...	0	1	950	5.39	1.29	--	--	--	--	--	.0
20...	40	2	1160	7.70	1.58	--	--	--	--	--	.0
DEC.											
04...	<10	1	927	6.01	1.26	.04	.08	7.5	7.5	.00	<.1
17...	20	1	963	5.49	1.31	.03	.09	7.5	7.5	.00	<.1
30...	10	1	936	5.18	1.27	.03	.12	8.0	8.0	.00	.0
JAN., 1975											
15...	10	1	953	6.12	1.30	.03	.04	7.9	7.9	.03	.0
22...											
03...	10	1	956	4.44	1.30	.18	.08	8.4	8.4	.03	.0

WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (00000)	TEMPER- ATURE (DEG C) (00010)	DIS- CHARGE (CFS) (00060)	INSTANT- DIS- CHARGE (CFS) (00061)	SPE- CIFIC CON- CENT- RATION (MICRO- MOS) (00095)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)	ALKA- LITY AS CACO3 (MG/L) (00410)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)
03.00	1300	2	--	20.0	--	--	1740	8.3	4.7	482	588	0
04.00	1000	2	--	11.0	--	.03	1620	8.0	8.9	459	559	0
05.00	1240	2	1882	21.0	--	.06	1640	8.2	5.4	437	533	0
06.00	1345	2	--	26.0	--	--	1630	8.2	5.6	451	550	0
07.00	1230	2	--	30.0	.02	--	1570	8.4	3.2	418	499	5
08.00	1330	2	--	30.0	--	--	1530	8.5	2.4	391	438	13
09.00	1140	2	--	25.0	--	.02	1540	8.2	4.6	374	456	0
10.00	0700	2	--	10.0	--	.03	1630	8.1	6.9	445	543	0
11.00	1415	2	--	27.0	--	.02	1580	8.3	3.7	376	459	0
12.00	1415	2	--	26.0	--	.02	1610	8.1	6.6	426	519	0
13.00	0840	2	--	12.5	--	.02	1640	8.1	6.8	436	532	0
14.00	1005	2	--	8.0	--	.02	1730	8.2	6.1	495	503	0
15.00	1200	2	--	8.0	--	.02	2010	--	--	545	654	--
16.00	0945	2	--	5.0	--	.04	1610	--	--	445	542	--
17.00	1210	2	--	11.0	--	--	1730	--	--	460	551	--
18.00	1120	2	--	12.0	--	.03	1590	--	--	428	522	--
19.00	1320	2	--	14.0	--	.07	1570	--	--	413	504	--
20.00	1030	2	--	7.0	--	.06	1620	--	--	444	541	--
21.00	1155	2	--	5.0	--	.15	1580	--	--	393	479	--
22.00	1330	2	--	13.5	--	.13	1450	--	--	400	488	--

# WATER QUALITY DATA

DATE	DIS- SOLVED NITRATE (%)	DIS- SOLVED PHOS- PHATE (P04)	DIS- SOLVED PHOS- PHORUS (P)	HARD- NESS (CA, MG) (%G/L)	NON- CAR- BONATE HARD- NESS (%G/L)	DIS- SOLVED CAL- CIUM (CA) (%G/L)	DIS- SOLVED MAG- NE- SIUM (MG) (%G/L)	DIS- SOLVED SODIUM (NA) (%G/L)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	DIS- SOLVED PO- TAS- SIUM (K) (%G/L)	DIS- SOLVED CALO- RIDE (CL) (%G/L)
MAY 1974												
03...	.16	.03	.01	690	200	110	100	140	2.7	33	7.0	10
17...	.08	.05	.02	650	200	100	100	160	2.7	34	2.8	8.6
22...	.02	.06	.02	650	210	95	100	160	2.7	35	2.7	8.5
31...	.04	.12	.04	650	200	96	99	150	2.6	33	2.5	10
JUNE												
14...	.03	.00	.00	610	190	88	95	150	2.6	35	2.7	9.1
21...	.03	.03	.01	580	200	79	94	150	2.7	35	1.9	8.5
25...	.01	.05	.02	620	250	68	97	150	2.6	34	2.1	7.5
JULY												
12...	.03	.00	.02	700	250	98	110	150	2.5	32	1.2	8.2
17...	.25	.12	.04	610	230	78	100	160	2.8	36	1.5	8.8
20...	.03	.00	.03	640	220	92	100	170	2.9	36	2.4	10
AUG.												
13...	.02	.06	.02	650	220	96	100	150	2.6	33	1.5	8.6
17...	.37	.09	.03	700	200	97	110	160	2.6	33	3.3	12
SEPT.												
12...	.01	.00	.00	740	200	105	120	220	3.5	39	9.8	29
27...	.08	.03	.01	660	210	98	100	150	2.5	33	4.2	9.7
OCT.												
03...	.02	.03	.01	590	130	77	96	190	3.2	40	6.4	19
09...	.02	.03	.01	590	150	77	94	150	2.7	36	1.9	11
16...	.02	.00	.00	610	190	94	90	150	2.7	35	4.1	10
23...	.01	.00	.00	620	160	100	91	150	2.8	36	4.6	11
30...	.04	.03	.01	550	140	48	100	160	3.0	39	4.9	12
NOV.												
14...	.12	.06	.02	550	150	92	84	130	2.4	34	3.1	9.4

WATER QUALITY DATA

	DIS- SOLVED SILICA (SI02) (MG/L) (00955)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED RADIUM (RA) (UG/L) (01005)	DIS- SOLVED LITHIUM (LI) (MG/L) (01010)	DIS- SOLVED RISMAITH (RI) (MG/L) (01015)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CADMIUM (CD) (UG/L) (01025)	DIS- SOLVED CHROMIUM (CR) (UG/L) (01030)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
DATE										
01/19/74	14	0	0	0	0	0	0	0	0	0
02/03/74	14	1	50	15	130	130	1	1	1	1
02/10/74	14	2	100	15	130	130	1	1	1	1
02/17/74	15	3	200	15	130	130	1	1	1	1
02/24/74	15	2	0	15	130	130	1	1	1	1
03/03/74	15	1	100	15	130	130	1	1	1	1
03/10/74	16	3	100	15	130	130	1	1	1	1
03/17/74	16	3	100	15	130	130	1	1	1	1
03/24/74	17	0	0	15	130	130	1	1	1	1
04/07/74	17	1	0	15	130	130	1	1	1	1
04/14/74	17	1	0	15	130	130	1	1	1	1
04/21/74	17	2	0	15	130	130	1	1	1	1
04/28/74	17	1	0	15	130	130	1	1	1	1
05/05/74	17	2	0	15	130	130	1	1	1	1
05/12/74	17	1	0	15	130	130	1	1	1	1
05/19/74	17	1	0	15	130	130	1	1	1	1
05/26/74	17	2	0	15	130	130	1	1	1	1
06/02/74	17	1	0	15	130	130	1	1	1	1
06/09/74	17	1	0	15	130	130	1	1	1	1
06/16/74	17	2	0	15	130	130	1	1	1	1
06/23/74	17	1	0	15	130	130	1	1	1	1
06/30/74	17	1	0	15	130	130	1	1	1	1
07/07/74	17	1	0	15	130	130	1	1	1	1
07/14/74	17	1	0	15	130	130	1	1	1	1
07/21/74	17	1	0	15	130	130	1	1	1	1
07/28/74	17	1	0	15	130	130	1	1	1	1
08/04/74	17	1	0	15	130	130	1	1	1	1
08/11/74	17	1	0	15	130	130	1	1	1	1
08/18/74	17	1	0	15	130	130	1	1	1	1
08/25/74	17	1	0	15	130	130	1	1	1	1
09/01/74	17	1	0	15	130	130	1	1	1	1
09/08/74	17	1	0	15	130	130	1	1	1	1
09/15/74	17	1	0	15	130	130	1	1	1	1
09/22/74	17	1	0	15	130	130	1	1	1	1
09/29/74	17	1	0	15	130	130	1	1	1	1
10/06/74	17	1	0	15	130	130	1	1	1	1
10/13/74	17	1	0	15	130	130	1	1	1	1
10/20/74	17	1	0	15	130	130	1	1	1	1
10/27/74	17	1	0	15	130	130	1	1	1	1
11/03/74	17	1	0	15	130	130	1	1	1	1
11/10/74	17	1	0	15	130	130	1	1	1	1
11/17/74	17	1	0	15	130	130	1	1	1	1
11/24/74	17	1	0	15	130	130	1	1	1	1
12/01/74	17	1	0	15	130	130	1	1	1	1
12/08/74	17	1	0	15	130	130	1	1	1	1
12/15/74	17	1	0	15	130	130	1	1	1	1
12/22/74	17	1	0	15	130	130	1	1	1	1
12/29/74	17	1	0	15	130	130	1	1	1	1
01/05/75	17	1	0	15	130	130	1	1	1	1
01/12/75	17	1	0	15	130	130	1	1	1	1
01/19/75	17	1	0	15	130	130	1	1	1	1
01/26/75	17	1	0	15	130	130	1	1	1	1
02/02/75	17	1	0	15	130	130	1	1	1	1
02/09/75	17	1	0	15	130	130	1	1	1	1
02/16/75	17	1	0	15	130	130	1	1	1	1
02/23/75	17	1	0	15	130	130	1	1	1	1
02/29/75	17	1	0	15	130	130	1	1	1	1
03/06/75	17	1	0	15	130	130	1	1	1	1
03/13/75	17	1	0	15	130	130	1	1	1	1
03/20/75	17	1	0	15	130	130	1	1	1	1
03/27/75	17	1	0	15	130	130	1	1	1	1
04/03/75	17	1	0	15	130	130	1	1	1	1
04/10/75	17	1	0	15	130	130	1	1	1	1
04/17/75	17	1	0	15	130	130	1	1	1	1
04/24/75	17	1	0	15	130	130	1	1	1	1
05/01/75	17	1	0	15	130	130	1	1	1	1
05/08/75	17	1	0	15	130	130	1	1	1	1
05/15/75	17	1	0	15	130	130	1	1	1	1
05/22/75	17	1	0	15	130	130	1	1	1	1
05/29/75	17	1	0	15	130	130	1	1	1	1
06/05/75	17	1	0	15	130	130	1	1	1	1
06/12/75	17	1	0	15	130	130	1	1	1	1
06/19/75	17	1	0	15	130	130	1	1	1	1
06/26/75	17	1	0	15	130	130	1	1	1	1
07/03/75	17	1	0	15	130	130	1	1	1	1
07/10/75	17	1	0	15	130	130	1	1	1	1
07/17/75	17	1	0	15	130	130	1	1	1	1
07/24/75	17	1	0	15	130	130	1	1	1	1
07/31/75	17	1	0	15	130	130	1	1	1	1
08/07/75	17	1	0	15	130	130	1	1	1	1
08/14/75	17	1	0	15	130	130	1	1	1	1
08/21/75	17	1	0	15	130	130	1	1	1	1
08/28/75	17	1	0	15	130	130	1	1	1	1
09/04/75	17	1	0	15	130	130	1	1	1	1
09/11/75	17	1	0	15	130	130	1	1	1	1
09/18/75	17	1	0	15	130	130	1	1	1	1
09/25/75	17	1	0	15	130	130	1	1	1	1
10/02/75	17	1	0	15	130	130	1	1	1	1
10/09/75	17	1	0	15	130	130	1	1	1	1
10/16/75	17	1	0	15	130	130	1	1	1	1
10/23/75	17	1	0	15	130	130	1	1	1	1
10/30/75	17	1	0	15	130	130	1	1	1	1
11/06/75	17	1	0	15	130	130	1	1	1	1
11/13/75	17	1	0	15	130	130	1	1	1	1
11/20/75	17	1	0	15	130	130	1	1	1	1
11/27/75	17	1	0	15	130	130	1	1	1	1
12/04/75	17	1	0	15	130	130	1	1	1	1
12/11/75	17	1	0	15	130	130	1	1	1	1
12/18/75	17	1	0	15	130	130	1	1	1	1
12/25/75	17	1	0	15	130	130	1	1	1	1
01/01/76	17	1	0	15	130	130	1	1	1	1
01/08/76	17	1	0	15	130	130	1	1	1	1
01/15/76	17	1	0	15	130	130	1	1	1	1
01/22/76	17	1	0	15	130	130	1	1	1	1
01/29/76	17	1	0	15	130	130	1	1	1	1
02/05/76	17	1	0	15	130	130	1	1	1	1
02/12/76	17	1	0	15	130	130	1	1	1	1
02/19/76	17	1	0	15	130	130	1	1	1	1
02/26/76	17	1	0	15	130	130	1	1	1	1
03/05/76	17	1	0	15	130	130	1	1	1	1
03/12/76	17	1	0	15	130	130	1	1	1	1
03/19/76	17	1	0	15	130	130	1	1	1	1
03/26/76	17	1	0	15	130	130	1	1	1	1
04/02/76	17	1	0	15	130	130	1	1	1	1
04/09/76	17	1	0	15	130	130	1	1	1	1
04/16/76	17	1	0	15	130	130	1	1	1	1
04/23/76	17	1	0	15	130	130	1	1	1	1
04/30/76	17	1	0	15	130	130	1	1	1	1
05/07/76	17	1	0	15	130	130	1	1	1	1
05/14/76	17	1	0	15	130	130	1	1	1	1
05/21/76	17	1	0	15	130	130	1	1	1	1
05/28/76	17	1	0	15	130	130	1	1	1	1
06/04/76	17	1	0	15	130	130	1	1	1	1
06/11/76	17	1	0	15	130	130	1	1	1	1
06/18/76	17	1	0	15	130	130	1	1	1	1
06/25/76	17	1	0	15	130	130	1	1	1	1
07/02/76	17	1	0	15	130	130	1	1	1	1
07/09/76	17	1	0	15	130	130	1	1	1	1
07/16/76	17	1	0	15	130	130	1	1	1	1
07/23/76	17	1	0	15	130	130	1	1	1	1
07/30/76	17	1	0	15	130	130	1	1	1	1
08/06/76	17	1	0	15	130	130	1	1	1	1
08/13/76	17	1	0	15	130	130	1	1	1	1
08/20/76	17	1	0	15	130	130	1	1	1	1
08/27/76	17	1	0	15	130	130	1	1	1	1
09/03/76	17	1	0	15	130	130	1	1	1	1
09/10/76	17	1	0	15	130	130	1	1	1	1
09/17/76	17	1	0	15	130	130	1	1	1	1
09/24/76	17									

09306025 - WEST FORK STEWART GULCH NEAR RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED TUNG (PP) (01045)	DIS- SOLVED LEAD (PP) (01046)	DIS- SOLVED MANGANESE (PP) (01054)	DIS- SOLVED COPPER (PP) (01050)	DIS- SOLVED NICKEL (PP) (01055)	DIS- SOLVED SILVER (PP) (01075)	DIS- SOLVED STRONTIUM (PP) (01080)	DIS- SOLVED VANADIUM (PP) (01045)	DIS- SOLVED ZINC (PP) (01090)	DIS- SOLVED TIN (PP) (01100)	DIS- SOLVED TUNG (PP) (01106)
03...	40	--	0	--	--	--	--	--	--	--	--
07...	30	--	20	--	--	--	--	--	--	--	--
20...	50	<20	0	<2	<10	<3	3200	<10	<10	<15	40
31...	50	6	10	--	--	--	--	--	20	--	--
04...	20	10	0	--	--	--	--	--	20	--	--
14...	30	2	0	--	--	--	--	--	20	--	--
21...	50	4	10	--	--	--	--	--	10	--	--
06...	40	0	0	--	--	--	--	--	30	--	--
12...	20	7	10	--	--	--	--	--	10	--	--
20...	50	4	20	--	--	--	--	--	10	--	--
05...	100	6	0	--	--	--	--	--	20	--	--
08...	80	2	10	--	--	--	--	--	30	--	--
12...	120	2	0	--	--	--	--	--	10	--	--
27...	60	2	0	--	--	--	--	--	10	--	--
01...	40	1	0	--	--	--	--	--	20	--	--
03...	60	3	0	--	--	--	--	--	40	--	--
16...	20	3	0	--	--	--	--	--	20	--	--
23...	30	0	10	--	--	--	--	--	10	--	--
02...	30	1	0	--	--	--	--	--	20	--	--
06...	210	3	0	--	--	--	--	--	40	--	--

AV 1974

09306025 - WEST FORK STEWART GULCH NEAR RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED GALLIUM (34) (UG/L) (01120)	DIS- SOLVED ZINC (35) (UG/L) (01125)	DIS- SOLVED LITHIUM (36) (UG/L) (01130)	DIS- SOLVED SELENIUM (37) (UG/L) (01145)	DIS- SOLVED TANTALUM (38) (UG/L) (01150)	DIS- SOLVED ZIRCONIUM (39) (UG/L) (01160)	DIS- SOLVED SOLIDS (SUM OF CONSTITUENTS) (40) (MG/L) (70301)	DIS- SOLVED SOLIDS (TONS PER DAY) (41) (70302)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (42) (70303)	DIS- SOLVED MERCURY (43) (UG/L) (71255)	ELEV. OF LAND SURFACE DATE (FT. ABOVE MSL) (72000)
MAY, 1974											
01...	--	--	--	--	--	--	1230	--	1.67	--	6568
02...	--	--	--	--	--	--	1190	.10	1.60	.0	6568
03...	--	--	--	--	--	--	1150	.19	1.54	.0	6568
04...	--	--	--	--	--	--	1130	--	1.54	.0	6568
05...	--	--	--	--	--	--	1080	.06	1.47	.0	6568
06...	--	--	--	--	--	--	1050	--	1.44	.0	6568
07...	--	--	--	--	--	--	1050	.06	1.44	.9	6568
08...	--	--	--	--	--	--	1120	.09	1.52	.0	6568
09...	--	--	--	--	--	--	1130	.05	1.54	.0	6568
10...	--	--	--	--	--	--	1160	.05	1.58	.0	6568
11...	--	--	--	--	--	--	1170	.06	1.59	.0	6568
12...	--	--	--	--	--	--	1240	.07	1.60	.0	6568
13...	--	--	--	--	--	--	1400	.08	1.90	.0	6568
14...	--	--	--	--	--	--	1130	.12	1.54	.0	6568
15...	--	--	--	--	--	--	1150	--	1.55	.0	6568
16...	--	--	--	--	--	--	1040	.08	1.41	.0	6568
17...	--	--	--	--	--	--	1090	.21	1.48	.0	6568
18...	--	--	--	--	--	--	1120	.18	1.52	.0	6568
19...	--	--	--	--	--	--	1030	.42	1.40	.0	6568
20...	--	--	--	--	--	--	943	.33	1.28	.0	6568



WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (000000)	TEMPER- ATURE (DEG C) (00010)	DIS- CHARGE (CFS) (00060)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHO/S) (00095)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)	ALKA- LIVITY AS CACO3 (MG/L) (00410)	BICAR- BONATE (HCO3) (MG/L) (00440)	CAR- BONATE (CO3) (MG/L) (00445)
MAY, 1974												
03...	1300	2	--	20.0	--	--	1740	8.3	4.7	482	588	0
17...	1000	2	--	11.0	--	.03	1620	8.0	8.9	459	559	0
22...	1240	2	1882	21.0	--	.06	1640	8.2	5.4	437	533	0
31...	1345	2	--	25.0	--	--	1630	8.2	5.6	451	550	0
JUNE												
16...	1230	2	--	30.0	.02	--	1570	8.4	3.2	418	498	5
24...	1330	2	--	30.0	--	--	1530	8.5	2.4	381	438	13
25...	1140	2	--	25.0	--	.02	1540	8.2	4.6	374	455	0
JULY												
02...	0700	2	--	10.0	--	.03	1630	8.1	6.9	445	543	0
11...	1415	2	--	27.0	--	.02	1580	8.3	3.7	376	459	0
20...	1415	2	--	26.0	--	.02	1610	8.1	6.6	426	519	0
AUG.												
03...	0440	2	--	12.5	--	.02	1640	8.1	6.8	436	532	0
10...	1005	2	--	8.0	--	.02	1730	8.2	6.1	495	603	0
SEP.												
12...	1200	2	--	8.0	--	.02	2010	--	--	545	564	--
27...	0845	2	--	5.0	--	.04	1610	--	--	445	542	--
OCT.												
03...	1210	2	--	11.0	--	--	1730	--	--	460	551	--
04...	1120	2	--	12.0	--	.03	1590	--	--	428	522	--
16...	1320	2	--	14.0	--	.07	1570	--	--	413	504	--
22...	1030	2	--	7.0	--	.06	1620	--	--	444	541	--
30...	1155	2	--	5.0	--	.15	1580	--	--	393	479	--
NOV.												
05...	1330	2	--	13.5	--	.13	1460	--	--	400	488	--

WATER QUALITY DATA

DATE	DIS- SOLVED NITRATE (N)	DIS- SOLVED PHOS- PHATE (P04)	DIS- SOLVED ORTHOP- PHOS- PHORUS (P)	HARD- NESS (CA+MG) (MG/L)	NON- CAR- BONATE HARD- NESS (MG/L)	DIS- SOLVED CAL- CIUM (CA) (MG/L)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	DIS- SOLVED PO- TAS- SIUM (K) (MG/L)	DIS- SOLVED CHLO- RIDE (CL) (MG/L)
	(00631)	(00660)	(00671)	(00900)	(00902)	(00915)	(00925)	(00931)	(00932)	(00935)	(00940)
MAY • 1974											
03...	.16	.03	.01	690	200	110	100	2.7	33	7.0	10
17...	.08	.05	.02	660	200	100	100	2.7	34	2.8	8.8
22...	.02	.05	.02	650	210	95	100	2.7	35	2.7	8.6
31...	.04	.12	.04	650	200	96	99	2.6	33	2.6	10
JUNE											
14...	.03	.00	.00	610	190	98	95	2.6	35	2.7	9.1
21...	.03	.03	.01	590	200	79	94	2.7	35	1.9	8.5
25...	.01	.06	.02	620	250	58	97	2.6	34	2.1	7.6
JULY											
02...	.03	.06	.02	700	250	98	110	2.5	32	1.2	8.2
11...	.25	.12	.04	610	230	78	100	2.8	36	1.5	8.8
20...	.03	.09	.03	640	220	92	100	2.9	36	2.4	10
AUG.											
03...	.02	.06	.02	650	220	96	100	2.6	33	1.5	8.6
10...	.37	.09	.03	700	200	97	110	2.6	33	3.9	12
SEP.											
12...	.01	.00	.00	740	200	100	120	3.5	39	9.8	29
27...	.08	.03	.01	660	210	98	100	2.5	33	4.2	9.7
OCT.											
03...	.02	.03	.01	590	130	77	96	3.2	40	6.4	19
09...	.02	.03	.01	580	150	77	94	2.7	36	1.9	11
16...	.00	.00	.00	610	190	94	93	2.7	35	4.1	10
23...	.01	.00	.00	620	180	100	91	2.8	36	4.6	11
30...	.08	.03	.01	530	140	48	100	3.0	39	4.9	12
NOV.											
05...	.12	.06	.02	550	150	92	84	2.4	34	3.1	9.4

WATER QUALITY DATA

DATE	DIS- SOLVED SULFATE (504) (UG/L) (00445)	DIS- SOLVED FLUO- RIDE (F) (UG/L) (00950)	DIS- SOLVED SILICA (SI02) (MG/L) (00955)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED RADIUM (BA) (UG/L) (01005)	DIS- SOLVED BERYL- LIUM (BE) (UG/L) (01010)	DIS- SOLVED BISMUTH (BI) (UG/L) (01015)	DIS- SOLVED BORON (R) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)
MAY - 1974												
03...	540	.2	14	--	--	--	--	--	--	--	--	--
17...	520	.3	10	0	--	--	--	--	--	--	--	--
22...	510	.1	8.9	1	60	<7	<15	90	0	<10	<20	<5
31...	490	1.2	12	2	100	--	--	130	1	--	--	4
JUNE												
14...	470	.2	15	3	200	--	--	130	1	--	--	6
21...	480	.0	15	2	0	--	--	130	1	--	--	2
26...	470	.2	15	1	<100	--	--	100	2	--	--	3
JULY												
02...	470	.1	16	3	<100	--	--	90	0	--	--	4
11...	540	.2	16	3	<100	--	--	120	2	--	--	2
20...	510	.2	17	0	0	--	--	160	1	--	--	5
AUG.												
02...	530	.2	17	1	0	--	--	110	1	--	--	2
10...	540	.2	18	1	0	--	--	120	2	--	--	5
SEP.												
12...	580	.1	17	2	0	--	--	150	<1	--	--	8
27...	450	.2	17	1	0	--	--	80	2	--	--	1
OCT.												
03...	480	.2	14	2	0	--	--	150	0	--	--	5
09...	430	.2	14	1	0	--	--	110	<1	--	--	2
16...	480	.2	13	1	<100	--	--	80	0	--	--	0
23...	470	.2	14	1	0	--	--	130	0	--	--	0
30...	450	.2	14	0	<100	--	--	40	0	--	--	0
NOV.												
06...	380	.2	13	1	<100	--	--	90	1	--	--	1

## WATER QUALITY DATA

DATE	DIS- SOLVED IRON (FE) (UG/L) (01045)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED MANGANESE (MN) (UG/L) (01056)	DIS- SOLVED MOLYB- DENUM (MO) (UG/L) (01060)	DIS- SOLVED NICKEL (NI) (UG/L) (01055)	DIS- SOLVED SILVER (AG) (UG/L) (01075)	DIS- SOLVED STRON- TIUM (SR) (UG/L) (01090)	DIS- SOLVED VANAD- IUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01093)	DIS- SOLVED TIN (SN) (UG/L) (01100)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01106)
MAY, 1974											
03...	40	--	0	--	--	--	--	--	--	--	--
17...	50	--	20	--	--	--	--	--	--	--	--
22...	50	<20	0	<7	<10	<3	3200	<10	<10	<15	40
31...	50	6	10	--	--	--	--	--	20	--	--
JUNE											
14...	20	10	0	--	--	--	--	--	20	--	--
21...	30	2	0	--	--	--	--	--	20	--	--
25...	50	4	10	--	--	--	--	--	10	--	--
JULY											
02...	40	0	0	--	--	--	--	--	30	--	--
11...	30	7	10	--	--	--	--	--	10	--	--
20...	50	4	20	--	--	--	--	--	10	--	--
AUG.											
03...	190	6	0	--	--	--	--	--	20	--	--
10...	80	2	10	--	--	--	--	--	30	--	--
SEP.											
12...	120	2	0	--	--	--	--	--	10	--	--
27...	60	2	0	--	--	--	--	--	10	--	--
OCT.											
03...	40	1	0	--	--	--	--	--	20	--	--
05...	50	3	0	--	--	--	--	--	40	--	--
16...	20	3	0	--	--	--	--	--	20	--	--
23...	20	0	10	--	--	--	--	--	10	--	--
30...	20	1	0	--	--	--	--	--	20	--	--
NOV.											
06...	210	3	0	--	--	--	--	--	40	--	--

WATER QUALITY DATA

DATE	DIS- SOLVED GALLIUM (GA) (UG/L) (01120)	DIS- SOLVED MANGANESE (GE) (UG/L) (01125)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)	DIS- SOLVED NIOBIUM (SE) (UG/L) (01145)	DIS- SOLVED TANTALUM (TI) (UG/L) (01150)	DIS- SOLVED ZIRCONIUM (ZR) (UG/L) (01160)	DIS- SOLIDS (SUM OF CONSTITUENTS) (MG/L) (70301)	DIS- SOLIDS (TONS PER DAY) (70302)	DIS- SOLIDS (TONS PER AC-FT) (70303)	DIS- SOLVED MERCURY (HG) (UG/L) (71590)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE VSL) (72000)
MAY • 1974											
03...	--	--	--	--	--	--	1230	--	1.67	--	6568
17...	--	--	--	0	--	--	1180	.10	1.60	.0	6568
24...	<10	<20	10	0	<10	<30	1150	.19	1.55	.0	6568
31...	--	--	10	0	--	--	1130	--	1.54	.0	6568
JUNE											
14...	--	--	10	1	--	--	1080	.05	1.47	.0	6568
21...	--	--	20	1	--	--	1060	--	1.44	.0	6568
26...	--	--	10	1	--	--	1060	.05	1.44	.9	6568
JULY											
02...	--	--	0	0	--	--	1120	.09	1.52	.0	6568
11...	--	--	0	0	--	--	1130	.05	1.54	.0	6568
29...	--	--	10	1	--	--	1160	.05	1.54	.0	6568
AUG.											
03...	--	--	0	0	--	--	1170	.05	1.59	.0	6568
10...	--	--	0	1	--	--	1240	.07	1.69	.0	6568
SEP.											
12...	--	--	0	1	--	--	1400	.08	1.90	.0	6568
27...	--	--	0	0	--	--	1130	.12	1.54	.0	6568
OCT.											
03...	--	--	0	0	--	--	1150	--	1.55	.0	6568
09...	--	--	0	0	--	--	1040	.08	1.41	.0	6568
16...	--	--	0	0	--	--	1090	.21	1.48	.0	6568
23...	--	--	0	0	--	--	1120	.18	1.52	.0	6568
30...	--	--	0	0	--	--	1030	.42	1.40	.0	6568
NOV.											
06...	--	--	0	5	--	--	943	.33	1.28	.0	6568

WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (00000)	TEMPER- ATURE (DEG C) (00010)	DIS- CHARGE (CFS) (00060)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00061)	TUP- RIN- ITY (JTD) (00070)	COLOR (RELAT- INVT- CORALT UNITS) (00080)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MUS) (00095)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)	ALKA- LITY AS CACOS (MG/L) (00410)
1974	1715	2	--	12.0	--	1.0	--	--	1590	8.2	5.8	455
1974	1745	2	--	17.0	--	1.6	--	--	1560	8.2	5.6	457
1974	1745	2	--	10.0	--	1.1	--	--	1390	7.9	10	425
1974	1745	2	1863	17.0	--	1.0	--	--	1400	7.9	10	414
1974	1745	2	--	16.0	--	1.1	--	--	1350	8.0	5.0	412
1974	1800	2	--	18.0	.67	--	--	--	1390	8.0	8.3	426
1974	1800	2	--	18.5	.99	.99	--	--	1410	8.0	7.7	395
1974	1845	2	--	14.0	--	.79	--	--	1390	8.0	8.1	415
1974	1845	2	--	16.5	--	1.5	--	--	1410	7.9	10	422
1974	1845	2	--	17.5	--	.94	--	--	1330	7.8	13	408
1974	1845	2	--	10.5	--	1.8	--	--	1400	7.9	11	434
1974	1845	2	--	13.0	--	1.8	--	--	1390	7.9	11	425
1974	1845	2	--	13.0	--	1.1	--	--	1390	--	--	436
1974	1845	2	--	11.0	--	.57	--	--	1400	--	--	421
1974	1920	2	--	11.5	--	--	--	--	1370	--	--	409
1974	1920	2	--	14.0	--	.56	--	--	1390	--	--	419
1974	1920	2	--	8.0	--	.58	--	--	1390	--	--	417
1974	1920	2	--	11.0	--	.77	--	--	1400	--	--	419
1974	1920	2	--	6.5	--	--	--	--	1440	--	--	450
1974	1930	2	--	9.0	--	.93	--	--	1450	--	--	449
1974	1945	2	--	8.5	--	1.4	--	--	1470	--	--	476
1974	1945	2	--	3.7	--	2.8	30	3	1500	8.7	1.7	438



## WATER QUALITY DATA

[illegible]

# WATER QUALITY DATA

DATE	DIS- SOL- ED	HARD- NESS (CA. 100) (%V/L) (00100)	NON- CAL- FONATE FERR- DESC (%V/L) (00000)	DIS- SOLVED CAL- CUM (CA. 100) (%V/L) (00100)	DIS- SOLVED MAG- NE- SOL- (MAG) (%V/L) (00000)	DIS- SOLVED SODIUM SORP- TION RATIO (00001)	PERCENT SODIUM (00012)	DIS- SOLVED PO- TAS- SIUM (K) (%V/L) (00000)	DIS- SOLVED CHLO- RIDE (CL) (%V/L) (00000)	DIS- SOLVED SULFATE (SO4) (%V/L) (00000)	DIS- SOLVED FLUO- RIDE (F) (%V/L) (00000)
1974											
123000	--	590	120	100	83	150	35	5.0	14	450	.5
123000	--	610	150	100	87	140	33	4.2	12	440	.5
123000	--	570	150	98	80	150	33	2.0	9.9	380	.3
123000	--	570	150	95	80	130	33	1.8	10	380	.3
123000	--	550	140	91	76	130	34	1.7	13	370	1.3
123000	--	570	140	96	80	130	33	2.3	10	340	.4
123000	--	560	160	92	80	140	35	3.8	9.9	360	.4
123000	--	540	130	94	75	130	34	1.7	11	350	.3
123000	--	570	140	95	80	130	33	2.2	12	380	.3
123000	--	540	130	91	75	130	34	2.2	12	360	.3
123000	--	560	130	90	76	130	33	2.0	11	360	.3
123000	--	550	140	99	77	160	41	2.2	11	500	.3
123000	--	550	120	98	75	130	34	1.6	12	320	.4
123000	--	550	130	96	75	130	34	2.6	10	360	.4
123000	--	460	51	64	73	130	38	2.3	10	330	.4
123000	--	490	74	72	76	140	38	1.1	11	350	.4
123000	--	540	130	99	72	120	32	2.3	9.9	340	.4
123000	--	490	69	80	70	130	37	2.5	10	330	.5
123000	--	560	110	100	76	130	33	2.9	11	340	.4
123000	--	570	120	100	77	130	33	2.3	10	350	.2
123000	--	540	68	99	72	140	36	2.6	11	350	.4
123000	--	540	140	100	79	120	31	1.5	11	330	.4

09300568 - WILLOW CREEK NEAR RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED SILICA (5.02) (0.5/L) (0.455)	DIS- SOLVED ARSENIC (AS) (0.5/L) (0.100)	DIS- SOLVED BARIUM (BA) (0.5/L) (0.1005)	DIS- SOLVED LITHIUM (LI) (0.5/L) (0.1010)	DIS- SOLVED BISPHENOL (BI) (0.5/L) (0.1015)	DIS- SOLVED BORON (B) (0.5/L) (0.1020)	DIS- SOLVED MANGANESE (MN) (0.5/L) (0.1025)	DIS- SOLVED CHROMIUM (CR) (0.5/L) (0.1030)	DIS- SOLVED COPPER (CU) (0.5/L) (0.1040)	DIS- SOLVED IRON (FE) (0.5/L) (0.1045)	DIS- SOLVED LEAD (Pb) (0.5/L) (0.1049)
02-1974	16	--	--	--	--	--	--	--	--	150	--
02-1974	17	--	--	--	--	--	--	--	--	40	--
02-1974	17	--	--	--	--	--	--	--	--	20	--
02-1974	16	1	55	<5	<13	120	0	<9	<4	20	<20
02-1974	15	2	0	--	--	130	1	--	2	30	3
02-1974	17	1	200	--	--	140	0	--	2	90	3
02-1974	15	1	<100	--	--	120	6	--	17	40	4
02-1974	15	2	<100	--	--	120	0	--	1	20	3
02-1974	17	2	<100	--	--	130	2	--	9	20	5
02-1974	16	0	0	--	--	60	1	--	3	50	2
02-1974	15	1	0	--	--	130	1	--	6	40	2
02-1974	15	1	0	--	--	130	1	--	5	20	3
02-1974	18	1	0	--	--	130	<1	--	3	40	2
02-1974	18	1	0	--	--	110	<1	--	1	50	2
02-1974	17	1	0	--	--	70	0	--	2	20	1
02-1974	15	2	0	--	--	140	<1	--	2	40	7
02-1974	17	1	<100	--	--	50	0	--	0	20	2
02-1974	18	1	0	--	--	160	0	--	0	40	3
02-1974	15	1	<100	--	--	20	0	--	0	20	1
02-1974	15	0	<100	--	--	150	1	--	2	320	5
02-1974	17	2	<100	--	--	70	0	--	1	30	1
02-1974	15	1	<100	--	--	120	1	<10	0	10	1

WATER QUALITY DATA

[illegible]

CY30505B - WILLOW CREEK NEAR RIO BLANCO, CO.

WATER CULTURE

[illegible]

WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (000008)	TEMPER- ATURE (DEG C) (00010)	DIS- CHARGE (CFS) (00060)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00061)	TUR- BID- ITY (J10) (00070)	COLOR (PLAT- INUM- CORALIT UNITS) (00080)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MOS) (00095)	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)
APR., 1974												
23...	1715	2	--	12.0	--	1.0	--	--	1590	--	8.2	5.8
MAY												
03...	1945	2	--	17.0	--	1.6	--	--	1550	--	8.2	5.6
17...	1245	2	--	10.0	--	1.1	--	--	1390	--	7.9	10
24...	1410	2	1003	17.0	--	1.0	--	--	1400	--	7.9	10
31...	1045	2	--	18.0	--	1.1	--	--	1350	--	8.0	8.0
JUNE												
14...	1500	2	--	18.0	.67	--	--	--	1380	--	8.0	8.3
25...	1500	2	--	18.5	.99	.99	--	--	1410	--	8.0	7.7
JULY												
02...	1045	2	--	14.0	--	.79	--	--	1390	--	8.0	8.1
11...	1200	2	--	16.5	--	1.3	--	--	1410	--	7.9	10
20...	1315	2	--	17.5	--	.94	--	--	1330	--	7.8	13
AUG.												
03...	1045	2	--	10.5	--	1.8	--	--	1400	--	7.9	11
10...	1415	2	--	13.0	--	1.8	--	--	1390	--	7.9	11
SEP.												
12...	1530	2	--	13.0	--	1.1	--	--	1390	--	--	--
27...	1245	2	--	11.0	--	.57	--	--	1400	--	--	--
OCT.												
04...	1420	2	--	11.5	--	--	--	--	1370	--	--	--
09...	1500	2	--	14.0	--	.56	--	--	1390	--	--	--
17...	1100	2	--	8.0	--	.58	--	--	1380	--	--	--
23...	1400	2	--	11.0	--	.77	--	--	1400	--	--	--
31...	1100	2	--	6.5	--	--	--	--	1440	--	--	--
NOV.												
05...	1430	2	--	9.0	--	.93	--	--	1460	--	--	--
20...	1245	2	--	8.5	--	1.4	--	--	1470	--	--	--
DEC.												
04...	1045	2	751700	4.0	--	3.3	70	5	3500	35	8.2	5.4
17...	1200	2	--	3.7	--	2.8	30	3	1500	--	8.7	1.7
JAN., 1975												
03...	1000	2	--	.0	--	2.4	9	3	1200	--	8.0	8.4
15...	--	2	--	3.5	--	2.5	40	5	1350	--	8.1	6.5
FEB.												
03...	1300	2	--	3.5	--	--	30	0	1500	--	7.5	27



WATER QUALITY DATA

DATE	ALKALINITY AS CaCO3 (MG/L) (00410)	BICARBONATE (MG/L) (00440)	CARBONATE (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS-SOLVED AMMONIA NITROGEN (MG/L) (00608)	DIS-SOLVED NITRITE (MG/L) (00613)	DIS-SOLVED NITRATE (MG/L) (00618)	TOTAL KJEL-DAML NITROGEN (MG/L) (00625)	DIS-SOLVED NITRITE PLUS NITRATE (MG/L) (00631)	DIS-SOLVED NITROPHOSPHATE (MG/L) (00650)	TOTAL PHOSPHORUS (MG/L) (00655)	DIS-SOLVED ORTHO-PHOSPHORUS (MG/L) (00671)
APR., 1974												
23...	468	570	0	--	--	--	--	--	.52	.12	--	.04
MAY												
03...	457	557	0	--	--	--	--	--	2.0	.09	--	.03
17...	425	518	0	--	--	--	--	--	.53	.09	--	.03
22...	414	505	0	--	--	--	--	--	.46	.09	--	.03
31...	412	502	0	--	--	--	--	--	.19	.12	--	.04
JUNE												
14...	426	519	0	--	--	--	--	--	.34	.06	--	.02
29...	395	462	0	--	--	--	--	--	.29	.03	--	.01
JULY												
02...	415	505	0	--	--	--	--	--	.23	.00	--	.00
11...	422	515	0	--	--	--	--	--	.46	.12	--	.04
20...	409	498	0	--	--	--	--	--	.35	.03	--	.01
AUG.												
03...	424	529	0	--	--	--	--	--	.27	.03	--	.01
10...	429	523	0	--	--	--	--	--	.28	.00	--	.00
SEP.												
12...	436	513	9	--	--	--	--	--	.39	.03	--	.01
27...	421	513	--	--	--	--	--	--	.43	.03	--	.01
OCT.												
06...	409	499	--	--	--	--	--	--	.42	.09	--	.03
09...	419	511	--	--	--	--	--	--	.94	.09	--	.03
17...	417	509	--	--	--	--	--	--	.54	.03	--	.01
23...	419	511	--	--	--	--	--	--	.48	.03	--	.01
31...	450	549	--	--	--	--	--	--	.48	.03	--	.01
NOV.												
06...	449	548	--	--	--	--	--	--	.29	.03	--	.01
20...	476	580	--	--	--	--	--	--	.80	.03	--	.01
DEC.												
05...	437	533	0	4	.07	.00	.40	.39	.40	.09	.65	.03
17...	436	534	0	1	.05	.00	.41	.20	.41	.03	.09	.01
JAN., 1975												
03...	428	522	0	7	.03	.00	.40	.25	.40	.03	.04	.01
19...	419	511	0	6	.02	.01	.60	.48	.61	.06	.08	.02
FEB.												
05...	436	531	0	5	.08	.00	.43	1.0	.43	.15	.05	.05

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WATER QUALITY DATA

DATE	CYANIDE (MG/L) (00720)	DIS- SOL- VED (00746)	HARD- NESS (MG/L) (00960)	NON- CAR- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED CAL- CIUM (MG/L) (00915)	DIS- SOLVED MAG- NE- SIUM (MG/L) (00925)	SODIUM AD- SORP- TION RATIO (00931)	PERCENT SODIUM (00932)	DIS- SOLVED PO- TAS- SIUM (MG/L) (00935)	DIS- SOLVED CHLO- RIDE (CL) (MG/L) (00940)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)
APR... 1974	--	--	520	120	100	83	2.7	35	5.0	14	450
MAY	--	--	610	150	100	87	2.5	33	4.2	12	440
JUN	--	--	570	150	94	80	2.4	33	2.0	9.9	390
JUL	--	--	570	150	95	80	2.4	33	1.8	10	380
AUG	--	--	560	140	94	78	2.4	34	1.7	13	370
SEP	--	--	570	140	96	80	2.4	33	2.3	10	340
OCT	--	--	560	160	92	80	2.6	35	3.8	9.5	350
NOV	--	--	540	130	94	75	2.4	34	1.7	11	350
DEC	--	--	570	140	95	80	2.4	33	2.2	12	350
JAN... 1975	--	--	540	130	91	75	2.4	34	2.2	12	350
FEB	--	--	550	120	98	75	2.4	34	1.6	12	220
MAR	--	--	550	130	96	75	2.4	34	2.5	10	350
APR	--	--	460	51	64	73	2.6	38	2.3	10	330
MAY	--	--	490	74	72	76	2.7	38	1.1	11	350
JUN	--	--	540	130	94	72	2.2	32	2.3	9.9	340
JUL	--	--	490	59	80	70	2.6	37	2.5	10	330
AUG	--	--	560	110	100	76	2.4	33	2.9	11	340
SEP	--	--	570	120	100	77	2.4	33	2.3	10	350
OCT	--	--	540	68	99	72	2.6	36	2.6	11	350
NOV	.00	.2	550	120	100	74	2.2	32	1.8	11	330
DEC	.01	.5	550	140	100	79	2.2	31	1.5	11	330
JAN... 1975	.00	.1	550	120	95	76	2.2	32	1.7	10	330
FEB	.00	.1	530	110	97	70	2.3	33	2.0	9.3	320
MAR	.00	.1	550	120	100	74	2.2	32	2.3	12	350

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WATER QUALITY DATA

DATE	DIS- SOLVED FLUO- PIL (F) (00950)	DIS- SOLVED SILICA (SI02) (00955)	DIS- SOLVED ARSENIC (AS) (01000)	DIS- SOLVED BARIUM (BA) (01005)	DIS- SOLVED LITHIUM (LI) (01010)	DIS- SOLVED BISMUTH (BI) (01015)	DIS- SOLVED MOLYBDENUM (MO) (01020)	DIS- SOLVED MANGANESE (MANG) (01025)	DIS- SOLVED CHROMIUM (CH) (01030)	DIS- SOLVED COBALT (CO) (01035)	DIS- SOLVED COPPER (CU) (01040)	DIS- SOLVED IRON (FE) (01045)
APR 1974												
23...	.5	15	--	--	--	--	--	--	--	--	--	150
MAY												
03...	.5	17	--	--	--	--	--	--	--	--	--	40
17...	.3	17	--	--	--	--	--	--	--	--	--	20
24...	.3	16	1	50	<13	<13	120	0	<9	<20	<4	20
31...	1.3	15	2	0	--	--	130	1	--	--	2	30
JUNE												
14...	.4	17	1	200	--	--	140	0	--	--	2	90
28...	.4	16	1	<100	--	--	120	6	--	--	17	40
JULY												
02...	.3	15	3	<100	--	--	120	0	--	--	1	20
11...	.3	17	2	<100	--	--	130	2	--	--	9	20
20...	.3	16	0	0	--	--	60	1	--	--	8	50
AUG												
03...	.3	15	1	0	--	--	130	1	--	--	6	40
10...	.3	18	1	0	--	--	130	1	--	--	5	20
SEP												
14...	.4	18	1	0	--	--	130	<1	--	--	3	40
27...	.4	14	1	0	--	--	110	<1	--	--	1	50
OCT												
07...	.4	17	1	0	--	--	70	0	--	--	2	20
19...	.4	18	2	0	--	--	140	<1	--	--	2	40
17...	.4	17	1	<100	--	--	90	0	--	--	0	20
23...	.5	14	1	0	--	--	160	0	--	--	0	40
31...	.4	15	1	<100	--	--	80	0	--	--	0	20
NOV												
06...	.2	8.2	0	<100	--	--	150	1	--	--	2	320
20...	.4	17	2	<100	--	--	70	0	--	--	1	30
DEC												
15...	.3	16	1	95	<2	<6	65	<20	<6	<6	3	300
17...	.4	16	1	<100	--	--	120	1	<10	--	0	10
JAN 1975												
03...	.4	15	0	<100	--	--	110	0	--	--	0	0
15...	.4	16	1	0	--	--	120	0	--	--	2	40
FEB												
03...	.3	17	4	100	--	--	110	1	--	--	4	10

WATER QUALITY DATA

DATE	DIS- SOLVED LEAD (PPM)	DIS- SOLVED GASES (PPM)	DIS- SOLVED NICKEL (PPM)	DIS- SOLVED SILVER (PPM)	DIS- SOLVED TUNG (PPM)	DIS- SOLVED VANAD (PPM)	DIS- SOLVED ZINC (PPM)	DIS- SOLVED TIN (PPM)	DIS- SOLVED ALUM (PPM)	DIS- SOLVED GALLIUM (PPM)	DIS- SOLVED VANADIUM (PPM)
APR 23, 1974	--	30	--	--	--	--	--	--	--	--	--
MAY 03, 1974	--	20	--	--	--	--	--	--	--	--	--
MAY 17, 1974	--	40	--	--	--	--	--	--	--	--	--
MAY 24, 1974	<20	20	<9	<2	3000	<9.0	8	<13	50	<9	<20
MAY 31, 1974	3	10	--	--	--	--	30	--	--	--	--
JUNE 04, 1974	2	0	--	--	--	--	30	--	--	--	--
JUNE 11, 1974	4	20	--	--	--	--	20	--	--	--	--
JUNE 18, 1974	3	0	--	--	--	--	30	--	--	--	--
JUNE 25, 1974	5	20	--	--	--	--	10	--	--	--	--
JULY 02, 1974	3	50	--	--	--	--	30	--	--	--	--
JULY 09, 1974	2	20	--	--	--	--	40	--	--	--	--
JULY 16, 1974	3	20	--	--	--	--	20	--	--	--	--
JULY 23, 1974	2	0	--	--	--	--	0	--	--	--	--
JULY 30, 1974	2	0	--	--	--	--	10	--	--	--	--
AUG 06, 1974	1	0	--	--	--	--	10	--	--	--	--
AUG 13, 1974	7	0	--	--	--	--	10	--	--	--	--
AUG 20, 1974	3	0	--	--	--	--	30	--	--	--	--
AUG 27, 1974	3	10	--	--	--	--	10	--	--	--	--
SEP 03, 1974	1	0	--	--	--	--	20	--	--	--	--
SEP 10, 1974	5	10	--	--	--	--	10	--	--	--	--
SEP 17, 1974	1	20	--	--	--	--	20	--	--	--	--
SEP 24, 1974	<6	70	<4	0	3500	<3.0	20	<6	320	<3	<6
SEP 30, 1974	1	0	--	--	--	--	10	--	--	--	--
OCT 07, 1974	1	20	--	--	--	--	20	--	--	--	--
OCT 14, 1974	3	10	--	--	--	--	20	--	--	--	--
OCT 21, 1974	2	30	--	--	--	--	30	--	--	--	--

## WATER QUALITY DATA

DATE	DIS- SOLVED LITHIUM (LI) (UG/L) (01120)	DIS- SOLVED SILICA (SI) (UG/L) (01145)	DIS- SOLVED TANTALUM (TI) (UG/L) (01150)	DIS- SOLVED ZINC (ZP) (UG/L) (01160)	DIS- SOLVED (SUM OF CONSTITUENTS) (UG/L) (70301)	DIS- SOLVED SOLIDS (TONS PER DAY) (70302)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (70303)	TOTAL ORTHOPHOSPHORUS (P) (MG/L) (70507)	DIS- SOLVED AMMONIA (NH4) (MG/L) (71245)
APR. 1974									
23...	--	--	--	--	1100	3.24	1.50	--	--
MAY									
03...	--	--	--	--	1090	4.87	1.47	--	--
17...	--	1	--	--	976	2.90	1.33	--	--
22...	8	1	<9	<30	964	2.81	1.31	--	--
21...	10	1	--	--	953	2.81	1.30	--	--
JUNE									
14...	10	1	--	--	933	1.69	1.27	--	--
26...	10	1	--	--	941	2.52	1.28	--	--
JULY									
02...	0	1	--	--	938	2.00	1.28	--	--
11...	0	2	--	--	973	3.49	1.32	--	--
20...	0	1	--	--	934	2.37	1.27	--	--
AUG.									
03...	0	2	--	--	956	4.65	1.30	--	--
10...	0	0	--	--	1150	5.55	1.55	--	--
SEP.									
12...	0	1	--	--	919	2.83	1.25	--	--
27...	0	2	--	--	947	1.46	1.29	--	--
OCT.									
04...	0	1	--	--	875	--	1.19	--	--
09...	0	1	--	--	925	1.40	1.25	--	--
17...	0	1	--	--	914	1.43	1.24	--	--
23...	0	1	--	--	895	1.35	1.22	--	--
31...	0	0	--	--	948	--	1.29	--	--
NOV.									
06...	0	1	--	--	950	2.39	1.29	--	--
20...	0	1	--	--	982	3.92	1.34	--	--
DEC.									
06...	5	1	10	<13	922	8.34	1.25	.52	.09
17...	10	1	--	--	924	7.19	1.25	.03	.06
JAN. 1975									
03...	10	2	--	--	908	5.91	1.23	.04	.04
16...	10	1	--	--	890	5.06	1.21	.04	.03
FEB.									
03...	0	1	--	--	940	--	1.28	.00	.10

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WATER QUALITY DATA

DATE	DIS- SOLVED NITRATE (MG/L) (71851)	DIS- SOLVED NITRATE (MG/L) (71856)	DIS- SOLVED MERCURY (MG) (71890)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE MSL) (72000)
APR., 1974				
23...	--	--	--	6273
MAY				
03...	--	--	--	6273
17...	--	--	.0	6273
22...	--	--	.0	6273
31...	--	--	.0	6273
JUNE				
14...	--	--	.0	6273
26...	--	--	.1	6273
JULY				
02...	--	--	.0	6273
11...	--	--	.0	6273
20...	--	--	.0	6273
AUG.				
03...	--	--	.0	6273
10...	--	--	.0	6273
SEP.				
12...	--	--	.2	6273
27...	--	--	.0	6273
OCT.				
04...	--	--	.0	6273
09...	--	--	.0	6273
17...	--	--	.0	6273
23...	--	--	.0	6273
31...	--	--	.0	6273
NOV.				
06...	--	--	.0	6273
20...	--	--	.0	6273
DEC.				
06...	1.8	.00	<.1	6273
17...	1.8	.00	<.1	6273
JAN., 1975				
03...	1.9	.00	.2	6273
16...	2.7	.03	.0	6273
FEB.				
03...	1.9	.00	.2	6273



WATER QUALITY DATA

TIME	TYPE	TYPE	SAMPLE NUMBER (000000)	TEMPERATURE (000.0)	INSTANTANEOUS DISCHARGE (CFS)	TURBIDITY (JTU)	COLOR (PLAT- TUM- COBALT UNITS)	SPECIFIC CONDUCTANCE (MICRO- MOS)	CHEMICAL OXYGEN DEMAND (HIGH LEVEL)	PH (UNITS)	CARBON DIOXIDE (CO2) (MG/L)	ALKALINITY AS CaCO3 (MG/L)
1415	2	2	--	14.0	29	--	--	1190	--	8.2	5.3	450
1415	2	2	--	7.5	30	--	--	1140	--	8.2	5.2	410
1415	2	2	--	11.0	6.3	--	--	1510	--	8.1	5.0	518
1415	2	2	1204	16.9	6.2	--	--	1599	--	8.2	4.8	550
1415	2	2	--	14.0	6.0	--	--	1560	--	8.2	5.8	550
1415	2	2	--	21.5	4.5	--	--	1540	--	8.2	6.4	522
1415	2	2	--	23.0	5.5	--	--	1540	--	8.2	6.5	527
1415	2	2	--	20.0	4.6	--	--	1660	--	8.0	11	510
1415	2	2	--	14.0	6.0	--	--	1530	--	9.2	7.0	544
1415	2	2	--	21.0	4.6	--	--	1540	--	7.9	12	508
1415	2	2	--	14.5	31	--	--	1140	--	7.6	20	493
1415	2	2	--	18.0	18	--	--	1340	--	8.1	7.8	493
1415	2	2	--	20.0	13	--	--	1360	--	--	--	479
1415	2	2	--	19.0	17	--	--	1320	--	--	--	458
1415	2	2	--	13.5	--	--	--	1140	--	8.1	5.5	363
1415	2	2	--	15.5	10	--	--	1330	--	--	--	452
1415	2	2	--	14.0	--	--	--	1500	--	--	--	504
1415	2	2	--	14.0	6.3	--	--	1470	--	--	--	502
1415	2	2	--	10.0	6.2	--	--	1550	--	--	--	512
1415	2	2	--	8.0	--	--	--	1560	--	--	--	544
1415	2	2	--	10.0	5.6	--	--	1490	--	--	--	509
1415	2	2	--	6.5	--	--	--	1340	--	--	--	470
1415	2	2	--	5.0	19	90	5	4000	12	8.3	4.5	443

WATER QUALITY DATA

DATE	BICARB- (-CO3) (MG/L) (00440)	CARB- BICARB (CO3) (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS- SOLVED AMMONIA NITRO- GEN (N) (MG/L) (00608)	DIS- SOLVED NITRATE (N) (MG/L) (00613)	DIS- SOLVED NITRATE (N) (MG/L) (00618)	TOTAL PHE- LITRO- GEN (N) (MG/L) (00623)	DIS- SOLVED NITRATE PLUS NITRATE (N) (MG/L) (00631)	DIS- SOLVED PHOS- PHATE (P) (MG/L) (00650)	TOTAL PHOS- PHATE (P) (MG/L) (00655)	DIS- SOLVED PHOS- PHATE (P) (MG/L) (00671)	CYANIDE (CN) (MG/L) (00720)
1974												
25...	524	0	--	--	--	--	--	.60	.12	--	.64	--
05...	511	0	--	--	--	--	--	.64	.03	--	.01	--
12...	631	0	--	--	--	--	--	.62	.12	--	.04	--
22...	674	0	--	--	--	--	--	.35	.15	--	.05	--
01...	671	0	--	--	--	--	--	.15	.09	--	.03	--
10...	634	0	--	--	--	--	--	.08	.06	--	.02	--
21...	743	0	--	--	--	--	--	.08	.03	--	.01	--
01...	567	0	--	--	--	--	--	.13	.09	--	.03	--
11...	600	0	--	--	--	--	--	.19	.00	--	.00	--
21...	619	0	--	--	--	--	--	.22	.21	--	.07	--
01...	791	0	--	--	--	--	--	.65	.09	--	.03	--
11...	601	0	--	--	--	--	--	.78	.18	--	.06	--
14...	584	--	--	--	--	--	--	.32	.03	--	.01	--
31...	555	--	--	--	--	--	--	.33	.09	--	.03	--
01...	443	--	--	--	--	--	--	.42	.05	--	.02	--
25...	551	--	--	--	--	--	--	.35	.09	--	.03	--
01...	615	--	--	--	--	--	--	.31	.18	--	.06	--
17...	612	--	--	--	--	--	--	.29	.09	--	.03	--
24...	651	--	--	--	--	--	--	.27	.12	--	.04	--
31...	663	--	--	--	--	--	--	.19	.09	--	.03	--
01...	520	--	--	--	--	--	--	.18	.03	--	.01	--
21...	573	--	--	--	--	--	--	.55	.03	--	.01	--
14...	555	0	8	.08	.41	.64	1.4	.65	.06	.13	.02	.00





WATER QUALITY DATA

DATE	DIS- SOLVED NITRO- GENE (MG) (01064)	DIS- SOLVED MOLYB- DENUM (MG) (01060)	DIS- SOLVED NICKEL (MG) (01055)	DIS- SOLVED SILVER (MG) (01075)	DIS- SOLVED THIO- SULF (MG) (01060)	DIS- SOLVED VANAD- IUM (V) (01085)	DIS- SOLVED ZINC (MG) (01090)	DIS- SOLVED TIN (MG) (01100)	DIS- SOLVED ALUM- INUM (AL) (01105)	DIS- SOLVED GALLIUM (MG) (01120)	DIS- SOLVED VANADI- UM (V) (01125)	DIS- SOLVED LITHIUM (MG) (01130)
23.00	30	--	--	--	--	--	--	--	--	--	--	--
17.00	1	--	--	--	--	--	--	--	--	--	--	--
17.00	80	--	--	--	--	--	--	--	--	--	--	--
20.00	70	--	--	--	--	--	--	--	--	--	--	--
21.00	100	--	--	--	--	--	--	--	--	--	--	--
21.00	100	--	--	--	--	--	--	--	--	--	--	--
21.00	110	--	--	--	--	--	--	--	--	--	--	--
25.00	100	--	--	--	--	--	--	--	--	--	--	--
25.00	150	--	--	--	--	--	--	--	--	--	--	--
25.00	150	--	--	--	--	--	--	--	--	--	--	--
25.00	70	--	--	--	--	--	--	--	--	--	--	--
25.00	60	--	--	--	--	--	--	--	--	--	--	--
25.00	60	--	--	--	--	--	--	--	--	--	--	--
25.00	10	--	--	--	--	--	--	--	--	--	--	--
25.00	50	--	--	--	--	--	--	--	--	--	--	--
25.00	20	--	--	--	--	--	--	--	--	--	--	--
25.00	0	--	--	--	--	--	--	--	--	--	--	--
25.00	150	--	--	--	--	--	--	--	--	--	--	--
25.00	60	--	--	--	--	--	--	--	--	--	--	--
25.00	140	--	--	--	--	--	--	--	--	--	--	--
25.00	150	--	--	--	--	--	--	--	--	--	--	--
25.00	60	--	--	--	--	--	--	--	--	--	--	--
25.00	40	--	--	--	--	--	--	--	--	--	--	--





WATER QUALITY DATA

DATE	TIME	TYPE	SAMPLE NUMBER (000000)	TEMPER- ATURE (DEG C) (00010)	INSTAN- TANEOUS DIS- CHARGE (CFS) (00061)	TUR- BID- ITY (JTU) (00070)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOUS) (00095)	CHEM- ICAL OXYGEN DEMAND (HIGH LEVEL) (MG/L) (00340)	PH (UNITS) (00400)	CARBON DIOXIDE (CO2) (MG/L) (00405)	ALKA- LITY AS CACO3 (MG/L) (00410)
1974	1815	2	--	14.0	29	--	--	1190	--	8.2	5.3	430
03-00	1645	2	--	7.5	30	--	--	1140	--	8.2	5.2	419
03-00	1400	2	--	11.0	6.3	--	--	1510	--	8.1	5.0	518
17-00	1545	2	1884	16.0	6.2	--	--	1590	--	8.2	5.3	553
24-00	1345	2	--	18.0	6.0	--	--	1550	--	8.2	5.3	550
04-00	1410	2	--	21.5	4.6	--	--	1540	--	8.2	5.4	522
14-00	1600	2	--	23.0	5.5	--	--	1540	--	8.2	5.5	527
21-00	1730	2	--	20.0	4.6	--	--	1660	--	8.0	11	549
06-00	1115	2	--	16.0	6.0	--	--	1630	--	8.2	7.0	556
11-00	1330	2	--	21.0	4.5	--	--	1530	--	7.9	12	508
20-00	1215	2	--	14.5	31	--	--	1140	--	7.6	20	403
05-00	1415	2	--	18.0	19	--	--	1340	--	8.1	7.6	493
10-00	1400	2	--	20.0	13	--	--	1360	--	--	--	479
16-00	1445	2	--	16.0	17	--	--	1220	--	--	--	453
01-00	1245	2	--	13.5	--	--	--	1180	--	8.1	5.6	350
02-00	1530	2	--	15.5	10	--	--	1330	--	--	--	452
04-00	1510	2	--	14.0	--	--	--	1500	--	--	--	504
10-00	1130	2	--	12.0	5.6	--	--	1500	--	--	--	511
17-00	1330	2	--	14.0	6.3	--	--	1470	--	--	--	502
24-00	1015	2	--	10.0	6.2	--	--	1550	--	--	--	542
01-00	1230	2	--	8.0	--	--	--	1560	--	--	--	544
05-00	1515	2	--	10.0	5.6	--	--	1490	--	--	--	509
10-00	1330	2	--	6.5	--	--	--	1340	--	--	--	470
06-00	1200	2	--	5.0	19	80	5	4000	12	8.3	4.5	463
13-00	1330	2	--	2.5	35	40	5	1400	--	8.3	4.4	453
00-00	1200	2	--	.0	--	20	5	1000	--	8.4	3.6	459
03-00	--	2	--	1.0	14	30	0	1390	--	8.1	6.9	447
02-00	1100	2	--	.0	--	10	--	1300	--	7.5	30	485

WATER QUALITY DATA

DATE	BICARB- ONATE (MG/L) (00440)	CAR- ONATE (MG/L) (00445)	OIL AND GREASE (MG/L) (00550)	DIS- SOLVED AMMONIA NITRO- GEN (MG/L) (00608)	DIS- SOLVED NITRITE (MG/L) (00613)	DIS- SOLVED NITRATE (MG/L) (00618)	TOTAL KJEL- DAHL NITRO- GEN (MG/L) (00625)	DIS- SOLVED NITRATE (MG/L) (00631)	DIS- SOLVED PHOS- PHATE (MG/L) (00660)	TOTAL PHOS- PHATE (MG/L) (00665)	DIS- SOLVED PHOS- PHATE (MG/L) (00671)	CYANIDE (MG/L) (00720)
APR 23 1974	524	0	--	--	--	--	--	.60	.12	--	.04	--
MAY 02	511	0	--	--	--	--	--	.64	.03	--	.01	--
MAY 17	631	0	--	--	--	--	--	.62	.12	--	.04	--
MAY 22	674	0	--	--	--	--	--	.35	.15	--	.05	--
MAY 31	671	0	--	--	--	--	--	.15	.09	--	.03	--
JUN 14	636	0	--	--	--	--	--	.08	.05	--	.02	--
JUN 21	643	0	--	--	--	--	--	.08	.03	--	.01	--
JUN 22	660	0	--	--	--	--	--	.13	.09	--	.03	--
JULY 02	690	0	--	--	--	--	--	.19	.00	--	.00	--
JULY 14	614	0	--	--	--	--	--	.22	.21	--	.07	--
JULY 20	491	0	--	--	--	--	--	.68	.09	--	.03	--
AUG 01	601	0	--	--	--	--	--	.78	.18	--	.06	--
AUG 16	584	--	--	--	--	--	--	.32	.03	--	.01	--
AUG 31	559	--	--	--	--	--	--	.33	.09	--	.03	--
SEP 20	443	--	--	--	--	--	--	.42	.06	--	.02	--
SEP 25	551	--	--	--	--	--	--	.35	.09	--	.03	--
OCT 01	615	--	--	--	--	--	--	.31	.18	--	.06	--
OCT 04	523	--	--	--	--	--	--	.31	.03	--	.01	--
OCT 17	512	--	--	--	--	--	--	.29	.09	--	.03	--
OCT 24	461	--	--	--	--	--	--	.27	.12	--	.04	--
OCT 31	563	--	--	--	--	--	--	.19	.09	--	.03	--
NOV 05	520	--	--	--	--	--	--	.18	.03	--	.01	--
NOV 20	573	--	--	--	--	--	--	.55	.03	--	.01	--
DEC 01	565	0	8	.08	.01	.64	1.4	.65	.06	.13	.02	.09
DEC 09	552	0	3	.04	.00	.79	.58	.79	.03	.17	.01	.00
JAN 18 1975	559	0	9	.03	.00	.73	.93	.73	.09	.08	.03	.09
JAN 15	545	0	7	.04	.01	.77	.52	.78	.06	.09	.02	.00
FEB 03	591	0	8	.04	.01	.68	.46	.69	.25	.11	.05	.00

WATER QUALITY DATA

DATE	DIS- SOL- VED (%)	NON- CAP- HUNTER HAYO- NESS (%)	DIS- SOLVED CAL- CIUM (%)	DIS- SOLVED MAG- NESIUM (%)	SODIUM AD- SORP- TION RATIO	PERCENT SODIUM	DIS- SOLVED TAS- SIUM (%)	DIS- SOLVED CLO- RIDE (%)	DIS- SOLVED FLUO- RIDE (%)
APR... 1974	--	410	75	55	120	2.6	3.3	13	220
23...	--	400	73	54	120	2.6	3.7	11	220
03...	--	510	79	76	170	3.3	3.8	14	350
17...	--	540	83	82	180	3.4	3.9	15	350
22...	--	540	84	81	180	3.4	4.2	15	350
21...	--	520	77	80	180	3.4	4.2	16	330
JUNE	--	520	78	79	180	3.4	4.0	15	340
14...	--	540	77	84	200	3.8	5.4	15	360
21...	--	570	84	88	180	3.3	3.8	15	350
22...	--	530	77	82	200	3.8	4.1	16	340
11...	--	370	72	47	120	2.7	5.5	13	220
JULY	--	450	79	62	150	3.1	4.3	15	270
12...	--	420	67	65	160	3.3	4.7	15	240
15...	--	450	75	64	150	3.1	4.2	15	240
31...	--	450	73	64	150	3.1	2.5	13	240
SEP...	--	470	77	67	140	2.8	3.6	12	220
04...	--	430	59	69	180	3.8	1.2	14	320
10...	--	500	75	76	170	3.3	3.5	14	290
17...	--	490	82	69	180	3.5	3.8	14	320
24...	--	530	83	78	170	3.2	4.3	14	330
31...	--	560	87	82	180	3.3	3.5	15	330
OCT...	--	520	85	75	170	3.2	4.0	15	330
06...	--	450	81	60	150	3.1	3.0	13	260
DEC...	0.2	490	87	66	140	2.8	2.6	12	240
19...	0.5	450	84	61	140	2.8	2.5	12	290
JAN... 1975	0.0	500	87	68	140	2.7	2.8	13	300
02...	0.0	450	79	64	140	2.8	2.6	12	290
15...	0.7	500	88	67	140	2.7	2.7	13	320
FEB...	0.5	500	88	67	140	2.7	2.7	13	320

WATER QUALITY DATA

DATE	DIS- SOLVED SILICA (SI02) (UG/L) (01055)	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED BARIUM (BA) (UG/L) (01005)	DIS- SOLVED LITHIUM (LI) (UG/L) (01010)	DIS- SOLVED BISMUTH (BI) (UG/L) (01015)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED MANGANESE (MN) (UG/L) (01025)	DIS- SOLVED CHROMIUM (CR) (UG/L) (01030)	DIS- SOLVED COBALT (CO) (UG/L) (01035)	DIS- SOLVED COPPER (CU) (UG/L) (01040)	DIS- SOLVED IRON (FE) (UG/L) (01045)	DIS- SOLVED LEAD (PB) (UG/L) (01049)
APR... 1974												
23...	15	--	--	--	--	--	--	--	--	--	110	--
17	--	--	--	--	--	--	--	--	--	--	20	--
19	--	--	--	--	--	--	--	--	--	--	20	--
22...	70	2	70	<7	<14	190	0	<10	<20	<5	50	<20
31...	0	3	0	--	--	240	1	--	--	2	20	7
JUNE												
14...	100	3	100	--	--	240	1	--	--	9	20	9
16...	0	3	0	--	--	240	0	--	--	2	20	5
21...	<100	3	<100	--	--	240	1	--	--	3	50	1
25...												
JULY												
02...	<100	6	<100	--	--	250	0	--	--	1	30	2
11...	<100	4	<100	--	--	270	2	--	--	5	20	3
21...	0	3	0	--	--	320	1	--	--	20	130	4
AUG.												
10...	0	3	0	--	--	230	<1	--	--	3	70	2
19...	0	2	0	--	--	240	2	--	--	6	40	1
31...	100	2	100	--	--	230	<1	--	--	5	880	9
SEP.												
17	0	4	0	--	--	200	1	--	--	7	90	1
20...	0	0	0	--	--	180	<1	--	--	.6	40	2
25...												
OCT.												
04...	0	2	0	--	--	270	0	--	--	4	10	0
10...	<100	2	<100	--	--	230	1	--	--	2	50	10
17...	<100	2	<100	--	--	200	0	--	--	0	30	2
24...	0	2	0	--	--	230	0	--	--	2	30	2
31...	<100	1	<100	--	--	170	0	--	--	2	10	0
NOV.												
08...	<100	2	<100	--	--	220	5	--	--	2	450	5
20...	<100	4	<100	--	--	200	0	--	--	0	10	2
DEC.												
06...	<100	3	<100	--	--	220	1	0	--	2	110	1
18...	<100	2	<100	--	--	160	2	0	--	1	10	2
JAN... 1975												
03...	<100	0	<100	--	--	170	0	0	--	2	10	3
16...	0	1	0	--	--	180	1	10	--	2	10	6
FEB.												
03...	<100	5	<100	--	--	150	1	10	--	5	30	2

## WATER QUALITY DATA

DATE	DIS- SOLVED MAN- GASESE (UG/L) (01055)	DIS- SOLVED MOLYB- DENOM (MO) (UG/L) (01060)	DIS- SOLVED WICKED (NI) (UG/L) (01065)	DIS- SOLVED SILVER (AG) (UG/L) (01075)	DIS- SOLVED TIUM (SP) (UG/L) (01080)	DIS- SOLVED VANA- DIUM (V) (UG/L) (01085)	DIS- SOLVED ZINC (ZN) (UG/L) (01090)	DIS- SOLVED TIN (SN) (UG/L) (01100)	DIS- SOLVED ALUM- INUM (AL) (UG/L) (01105)	DIS- SOLVED GALLIUM (GA) (UG/L) (01120)	DIS- SOLVED MANG- NIUM (GE) (UG/L) (01125)	DIS- SOLVED LITHIUM (LI) (UG/L) (01130)
APR 1974												
20...	30	--	--	--	--	--	--	--	--	--	--	--
21...	10	--	--	--	--	--	--	--	--	--	--	--
22...	60	--	--	--	--	--	--	--	--	--	--	--
23...	70	7	<10	<3	2400	<10	<10	<15	50	<10	<20	6
24...	100	--	--	--	--	--	20	--	--	--	--	10
JUL 1974												
10...	100	--	--	--	--	--	20	--	--	--	--	10
11...	110	--	--	--	--	--	20	--	--	--	--	10
12...	190	--	--	--	--	--	30	--	--	--	--	0
13...	150	--	--	--	--	--	20	--	--	--	--	0
14...	150	--	--	--	--	--	10	--	--	--	--	0
15...	70	--	--	--	--	--	50	--	--	--	--	0
16...	80	--	--	--	--	--	20	--	--	--	--	0
17...	80	--	--	--	--	--	0	--	--	--	--	0
18...	10	--	--	--	--	--	10	--	--	--	--	0
SEP 1974												
20...	50	--	--	--	--	--	40	--	--	--	--	0
21...	20	--	--	--	--	--	10	--	--	--	--	0
22...	0	--	--	--	--	--	10	--	--	--	--	0
23...	150	--	--	--	--	--	30	--	--	--	--	0
24...	150	--	--	--	--	--	10	--	--	--	--	0
25...	170	--	--	--	--	--	20	--	--	--	--	0
26...	140	--	--	--	--	--	0	--	--	--	--	0
27...	150	--	--	--	--	--	10	--	--	--	--	0
28...	60	--	--	--	--	--	10	--	--	--	--	0
29...	40	--	--	--	--	--	30	--	--	--	--	10
30...	20	--	--	--	--	--	0	--	--	--	--	10
JAN 1975												
03...	30	--	--	--	--	--	10	--	--	--	--	10
04...	20	--	--	--	--	--	30	--	--	--	--	10
05...	40	--	--	--	--	--	30	--	--	--	--	10
06...	40	--	--	--	--	--	0	--	--	--	--	10
07...	40	--	--	--	--	--	30	--	--	--	--	10
08...	40	--	--	--	--	--	30	--	--	--	--	10
09...	40	--	--	--	--	--	30	--	--	--	--	10

WATER QUALITY DATA

DATE	DIS- SOLVED NICKEL (52) (01145)	DIS- SOLVED TANTALUM (11) (01150)	DIS- SOLVED ZINC (24) (01160)	DIS- SOLVED (SOLV OF CONSTI- TUENTS) (V6/L) (70301)	DIS- SOLIDS (IONS PER AC-FI) (70303)	TOTAL ORTHOPHOS- PHORUS (P) (V6/L) (70507)	DIS- SOLVED AMMONIA (NH4) (V6/L) (71845)	DIS- SOLVED NITRATE (NO2) (V6/L) (71851)	DIS- SOLVED NITRITE (NO2) (V6/L) (71856)	DIS- SOLVED MERCURY (43) (U6/L) (71890)	ELEV. OF LAND SURFACE DITON (FT.) ABOVE VSL) (72000)
10/1/74	--	--	--	765	1.04	--	--	--	--	--	6214
11/1/74	--	--	--	754	1.03	--	--	--	--	--	6214
12/1/74	0	--	--	1030	1.40	--	--	--	--	0	6214
1/1/75	1	<10	<30	1970	1.46	--	--	--	--	0	6214
2/1/75	1	--	--	1050	1.44	--	--	--	--	0	6214
3/1/75	2	--	--	1020	1.39	--	--	--	--	0	6214
4/1/75	1	--	--	1030	1.40	--	--	--	--	0	6214
5/1/75	1	--	--	1090	1.48	--	--	--	--	0	6214
6/1/75	2	--	--	1080	1.47	--	--	--	--	0	6214
7/1/75	1	--	--	1080	1.47	--	--	--	--	0	6214
8/1/75	0	--	--	735	1.00	--	--	--	--	0	6214
9/1/75	1	--	--	901	1.23	--	--	--	--	5	6214
10/1/75	1	--	--	881	1.20	--	--	--	--	0	6214
11/1/75	1	--	--	885	1.20	--	--	--	--	0	6214
12/1/75	0	--	--	821	1.12	--	--	--	--	0	6214
1/1/76	1	--	--	872	1.19	--	--	--	--	0	6214
2/1/76	1	--	--	949	1.29	--	--	--	--	0	6214
3/1/76	1	--	--	957	1.30	--	--	--	--	0	6214
4/1/76	1	--	--	992	1.35	--	--	--	--	0	6214
5/1/76	1	--	--	1020	1.40	--	--	--	--	0	6214
6/1/76	0	--	--	1050	1.43	--	--	--	--	0	6214
7/1/76	1	--	--	1000	1.36	--	--	--	--	0	6214
8/1/76	1	--	--	870	1.18	--	--	--	--	0	6214
9/1/76	1	--	--	887	1.21	0.05	0.10	2.8	0.03	<.1	6214
10/1/76	1	--	--	856	1.21	0.05	0.05	3.5	0.00	<.1	6214
11/1/76	2	--	--	907	1.23	0.04	0.04	3.2	0.00	0	6214
12/1/76	1	--	--	878	1.19	0.05	0.05	3.4	0.03	0	6214
1/1/77	1	--	--	944	1.28	--	0.05	3.0	0.03	.1	6214



09306039 - COTTONWOOD GULCH NEAR RIO BLANCO, CO.

WATER QUALITY DATA

SAMPLE NUMBER	TEMPER- ATURE (DEG C)	INSTAN- TANEOUS DIS- CHARGE (CFS)	TUR- BID- ITY (JTU)	COLOR (PLAT- INUM- CORALI UNITS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MOS)	PH	CARBON DIOXIDE (CO2) (MG/L)	ALKA- LITY AS CACO3 (MG/L)	BICAR- BONATE (MG/L) (00440)
(00008)	(00010)	(00051)	(00070)	(00020)	(00095)	(00400)	(00405)	(00410)	(00440)

DATE	TIME	TYPE	SAMPLE NUMBER	TEMPER- ATURE (DEG C)	INSTAN- TANEOUS DIS- CHARGE (CFS)	TUR- BID- ITY (JTU)	COLOR (PLAT- INUM- CORALI UNITS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MOS)	PH	CARBON DIOXIDE (CO2) (MG/L)	ALKA- LITY AS CACO3 (MG/L)	BICAR- BONATE (MG/L) (00440)
DEC.. 1974	1045	2	751700	5.0	.38	200	20	1220	8.5	2.5	402	449
05...												

WATER QUALITY DATA

DATE	CAP- SODIUM (003)	OIL AND GREASE (00550)	DIS- SOLVED AMMONIA NITRO- GEN (N) (MG/L) (00608)	DIS- SOLVED NITRATE (N) (MG/L) (00613)	DIS- SOLVED NITRATE (N) (MG/L) (00618)	TOTAL KJEL- DAHL NITRO- GEN (N) (MG/L) (00625)	DIS- SOLVED NITRATE PLUS NITRATE (N) (MG/L) (00631)	DIS- SOLVED ORTHO- PHOS- PHATE (PO4) (MG/L) (00650)	TOTAL PHOS- PHORUS (P) (MG/L) (00665)	DIS- SOLVED ORTHO- PHOS- PHORUS (P) (MG/L) (00671)	DIS- SOL- VED SUL- FIDE (S) (MG/L) (00746)
------	-------------------------	---------------------------------	--	---	---	---	--	--	--	---	---

DEC.. 1974

05... 20 0 .18 .01 .22 .50 .23 .06 .98 .02 .2

WATER QUALITY DATA

DATE	HARD- NESS (CA+MG) (MG/L) (00900)	NON- CAL- BONATE HARD- NESS (MG/L) (00902)	DIS- SOLVED MAG- NES- IUM (MG) (MG/L) (00925)	DIS- SOLVED SODIUM (NA) (MG/L) (00930)	SODIUM AD- SORP- TION RATIO (00931)	PERCENT SODIUM (00932)	DIS- SOLVED PO- TAS- SIUM (K) (MG/L) (00935)	DIS- SOLVED C-LO- RIDE (CL) (MG/L) (00940)	DIS- SOLVED SULFATE (SO4) (MG/L) (00945)	DIS- SOLVED FLUO- RIDE (F) (MG/L) (00950)	DIS- SOLVED SILICA (SiO2) (MG/L) (00955)
------	---	--	--	---	--	------------------------------	---	--	---	---	---

DEC.. 1974 270 0 50 34 200 5.3 62 1.3 30 230 5.2 17  
 05...

09306034 - COTTONWOOD CULCH NEAR RIO BLANCO, CO.

WATER QUALITY DATA

DATE	DIS- SOLVED ARSENIC (AS) (UG/L) (01000)	DIS- SOLVED RADIUM (RA) (UG/L) (01005)	DIS- SOLVED BERYL- LIUM (BE) (UG/L) (01010)	DIS- SOLVED NICKEL (NI) (UG/L) (01015)	DIS- SOLVED BORON (B) (UG/L) (01020)	DIS- SOLVED CAD- MIUM (CD) (UG/L) (01025)	DIS- SOLVED CHRO- MIUM (CR) (UG/L) (01030)	DIS- SOLVED COPPER (CU) (UG/L) (01040)	DIS- SOLVED IRON (FE) (UG/L) (01045)	DIS- SOLVED LEAD (PB) (UG/L) (01049)	DIS- SOLVED VAN- GASESE (V) (UG/L) (01055)
------	--	---	---	---	---	---	--	---	---	---	--

DEC. 1974 7 180 <2 150 <20 <6 140 <6 3 140 <6 5  
05...

09306039 - COTTONWOOD SLCH NEAR RIO BLANCO. CO.

WATER QUALITY DATA

DATE	DIS- SOLVED MOLYB- DENUR (MO) (03/L) (01069)	DIS- SOLVED SILVER (AG) (03/L) (01075)	DIS- SOLVED SILVER (SP) (03/L) (01080)	DIS- SOLVED VANAD- DIUM (V) (03/L) (01085)	DIS- SOLVED ZINC (Zn) (06/L) (01090)	DIS- SOLVED TIN (SN) (06/L) (01100)	DIS- SOLVED ALUM- INUM (AL) (03/L) (01106)	DIS- SOLVED GALLIUM (GA) (03/L) (01120)	DIS- SOLVED MANG- NIUM (SE) (03/L) (01125)	DIS- SOLVED LITHIUM (LI) (03/L) (01130)	DIS- SOLVED SELE- NIUM (SE) (03/L) (01145)
DEC. 1974	10	<4	0	3300	<3.0	<6	140	<3	<6	20	4
05...											

09396039 - COTTONWOOD GULCH NEAR RIO BLANCO, CO.

WATER QUALITY DATA

DIS- SOLVED TIT- TANUM (TI) (01180)	DIS- SOLVED ZIR- CONIUM (ZR) (01160)	DIS- SOLIDS (SUM OF CONSTIT- TUENTS) (01301)	DIS- SOLVED SOLIDS (TONS PER DAY) (70392)	DIS- SOLVED SOLIDS (TONS PER AC-FT) (70303)	TOTAL PHOS- PHORUS (P) (0140)	DIS- SOLVED AMMONIA (NH4) (MG/L) (71845)	DIS- SOLVED NITRATE (NO3) (MG/L) (71851)	DIS- SOLVED NITRITE (NO2) (MG/L) (71856)	DIS- SOLVED MERCURY (HG) (UG/L) (71890)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE VSL) (72000)
--	---	---	---	---	---	---	---	---	--	--

DEC. 1974  
05...

6	<11	814	.84	1.11	.80	.23	.97	.03	<.1	6353
---	-----	-----	-----	------	-----	-----	-----	-----	-----	------





## II A-2 SPRINGS AND SEEPS

Water quality samples from all springs and seeps adjacent to Tract C-b were collected and analyzed during the first quarterly report period, and the analytical data were included in the first report.

The ground temperatures were generally cold throughout the second quarterly period, with the result that many of the seepage areas were covered by snow or were frozen. It is planned that at least one additional water quality sampling run on springs and seeps will be conducted in April or May; results from that sampling run will be included in a subsequent quarterly report.

CORE DRILLING AND  
ASSOCIATED GROUND WATER

## II B CORE DRILLING AND ASSOCIATED GROUND WATER

The following Well Summary Table is similar in content to the summary presented in Quarterly Report #1. However, it has been revised to reflect activities completed or additional data received in the second quarter.



QUARTERLY REPORT #2  
Well Summary Table

1. Well Designation	AT-1	AT-1a	AT-1a	AT-1b	AT-1c	AT-1d	SG-1	SG-1a	SG-6	SG-8	SG-9	SG-10	SG-10a	SG-11
2. Well Type	AT	AT CH	AT	AT	AT	AT	CH	GHT	AT CH	CH	CH	AT CH	GHT	AT CH
3. Drilling Completion Date	1/23 75	7/1 74	7/10 74	7/20 74	8/18 74	7/28 74	12/6 74	2/7 75	8/22 74	11/27 74	10/23 74	6/29 74	7/10 74	9/8 74
4. Total Depth (Feet)	1338	1621	1341	1638	1640	1640	2525	1180	2220	2608	2750	2211	1333	2826
5. Water Data														
a. Drilling Water Production	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q			C1Q	C1Q	C1Q	C1Q	C1Q	C1Q
b. Drilling Water Samples (Number)	1	4	NA	NA	4	NA	7		5		5	4	NA	25
c. Water Quality Analyses	C1Q	C1Q			C1Q		C2Q		C1Q		C1Q	C1Q		C1Q
6. Aquifer Data														
a. Drill Stem Tests		C1Q			C1Q							C1Q		
b. Jetting Tests	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C2Q		C1Q	C1Q	C1Q	C1Q	C1Q	C1Q
7. Geophysical Logs, Schlumberger					Inc.				Inc.					
a. Borehole, Compensated Sonic	C1Q			C1Q		C1Q	C2Q			C2Q	C2Q			C1Q
b. Laterolog	C1Q			C1Q		C1Q	C2Q			C2Q	C2Q			C1Q
c. Formation Density	C1Q			C1Q		C1Q	C2Q	C2Q		C2Q	C2Q			
d. Nuclear Formation Density				C1Q		C1Q								
e. Temperature	C1Q	C1Q		C1Q		C1Q	C2Q			C2Q	C2Q	C1Q		C1Q
f. Cement Bond Log						Inc.								Inc.
8. Geophysical Logs, Birdwell														
a. Velocity, 3-dimensional		C1Q										C1Q		
b. Electric		C1Q										C1Q		
c. Density		C1Q										C1Q		
d. Nuclear		C1Q										C1Q		
e. Caliper		C1Q										C1Q		
f. Temperature		C1Q										C1Q		
9. Geophysical Logs, Other														
a. Welex, Micro-seismogram		Inc.										Inc.		
b. McCullough, Temperature				Inc.										
10. Field Lithologic Log	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C2Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q
11. Cored Interval (Feet From Surface)														
a. Top	NA	1270	NA	NA	NA	NA	550		1195	580	1200	1200	NA	750
b. Bottom	NA	1519	NA	NA	NA	NA	2525		2220	2608	2750	2211	NA	2810
12. Assay Data														
a. Fischer Assay	NA	C1Q	NA	NA	NA	NA					C2Q	C1Q	NA	C1Q
b. Soluble Sodium	NA	C1Q	NA	NA	NA	NA					C2Q	C1Q	NA	
c. Alumina	NA	C1Q	NA	NA	NA	NA					C2Q	C1Q	NA	
13. Trace Element Analysis			C2Q							C2Q	C2Q	C2Q		
14. Rock Mechanics Data		C1Q												
15. Gas Data														
a. Drilling Log	NA	NA	NA	NA		NA	C1Q		C1Q	C1Q	C1Q		NA	C1Q
b. Bomb Samples (Number Taken)	NA	NA	NA	NA	2	NA	8		4	11	8		NA	6
c. Bomb Analyses	NA	NA	NA	NA	C2Q	NA	C1Q	C1Q	C1Q	C1Q	C1Q			C1Q
Completion Data	C2Q	C1Q	C1Q	C1Q	C1Q	C1Q	C2Q	C2Q	C1Q	C2Q	C1Q	C1Q	C1Q	C1Q
17. Survey Plat	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q		C1Q	C1Q	C1Q	C1Q		C1Q

KEY: NA = Not Applicable  
Inc. = Incomplete  
C1Q = Complete, First Quarterly Report  
C2Q = Complete, Second Quarterly Report

AT = Aquifer Test Well  
AW = Alluvial Well  
CH = Standard Core Hole  
GHT = Ground Water/Hydrologic Test Well  
AB = Abandoned



QUARTERLY REPORT #2  
Well Summary Table (Continued)

1. Well Designation	SG-17	SG-18	SG-18a	SG-19	SG-20	SG-21	Ch-1	Ch-2	Ch-2b	Ch-3	Ch-4			
2. Well Type	CH	AB	CH	CH	CH	CH	CH	CH	AB	CH	CH			
3. Drilling Completion Date	1/13/75	10/13/74	10/18/74	9/28/74	12/13/74	1/8/75	OLD	OLD	9/20/74	OLD	OLD			
4. Total Depth (Feet)	2460	1426	1330	980	981	1036	2103	1469	1220		1470			
5. Water Data														
a. Drilling Water Production		C1Q	C1Q	C1Q			NA	NA	C1Q	NA	NA			
b. Drilling Water Samples (Number)	31	3	1	4	5	5								
c. Water Quality Analyses	C2Q	C1Q	C1Q	C1Q	C2Q	C2Q								
6. Aquifer Data														
a. Drill Stem Tests	C2Q				C2Q	C2Q	NA	NA		NA	NA			
b. Jetting Tests		C1Q	C1Q	C1Q	C2Q	C2Q	NA	NA	C1Q	NA	NA			
7. Geophysical Logs, Schlumberger														
a. Borehole, Compensated Sonic	C2Q	C1Q		C1Q	C2Q	C2Q								
b. Laterolog	C2Q	C1Q		C1Q		C2Q								
c. Formation Density	C2Q	C1Q		C1Q	C2Q	C2Q								
d. Nuclear Formation Density														
e. Temperature	C2Q	C1Q		C1Q	C2Q	C2Q								
f. Cement Bond Log								Inc.			Inc.			
8. Geophysical Logs, Birdwell														
a. Velocity, 3-dimensional														
b. Electric														
c. Density														
d. Nuclear														
e. Caliper														
f. Temperature							C1Q	C1Q		C1Q	C1Q			
9. Geophysical Logs, Other														
a. Welox, Micro-seismogram														
b. McCullough, Temperature														
10. Field Lithologic Log	C2Q	C1Q	C1Q	C1Q	C2Q	C2Q	NA	NA	C1Q	NA	NA			
11. Cored Interval (Feet From Surface)														
a. Top		1380	NA	930			NA	NA	NA	NA	NA			
b. Bottom		1426	NA	980			NA	NA	NA	NA	NA			
12. Assay Data														
a. Fischer Assay		C1Q	NA	C1Q			NA	NA	NA	NA	NA			
b. Soluble Sodium							NA	NA	NA	NA	NA			
c. Alumina							NA	NA	NA	NA	NA			
13. Trace Element Analysis														
14. Rock Mechanics Data							NA	NA	NA	NA	NA			
15. Gas Data														
a. Drilling Log	C2Q	C1Q	C1Q	C1Q	C2Q	-	NA	NA	C1Q	NA	NA			
b. Bomb Samples (Number Taken)	31	1	1	4	5	4	NA	NA	1	NA	NA			
c. Bomb Analyses	C1Q2Q	C1Q	C1Q	C1Q	C2Q	C2Q	NA	NA	C1Q	NA	NA			
Completion Data	C2Q	C1Q	C1Q	C1Q	C2Q	C2Q	C1Q	C2Q	C1Q	C1Q	C1Q			
17. Survey Plat	C1Q	C1Q		C1Q	C1Q	C1Q	C1Q	C1Q		C1Q	C1Q			

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CH = Ground Water/Hydrologic Test Well  
AB = Abandoned

QUARTERLY REPORT #2  
Well Summary Table (Continued)

1. Well Designation	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	
2. Well Type	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	AW	
3. Drilling Completion Date	10/2 74	10/4 74	10/7 74	10/8 74	10/3 74	10/10 74	9/28 74	10/1 74	9/23 74	9/23 74	9/24 74	9/24 74	10/8 74	
4. Total Depth	109	82	112	64	86	60	51	70	57	67	66	81	14	
5. Water Data														
a. Drilling Water Production														
b. Drilling Water Samples (Number)														
c. Water Quality Analyses	C1Q	C1Q	C1Q	NA	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	NA	
6. Aquifer Data														
a. Drill Stem Tests														
b. Jetting Tests														
7. Geophysical Logs, Schlumberger														
a. Borehole, Compensated Sonic														
b. Laterolog														
c. Formation Density														
d. Nuclear Formation Density														
e. Temperature														
f. Cement Bond Log														
8. Geophysical Logs, Birdwell														
a. Velocity, 3-dimensional														
b. Electric														
c. Density														
d. Nuclear														
e. Caliper														
f. Temperature														
9. Geophysical Logs, Other														
a. Welex, Micro-seismogram														
b. McCullough, Temperature														
10. Field Lithologic Log	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C2Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	
11. Cored Interval (Feet From Surface)														
a. Top														
b. Bottom														
12. Assay Data														
a. Fischer Assay														
b. Soluble Sodium														
c. Alumina														
13. Trace Element Analysis														
14. Rock Mechanics Data														
15. Gas Data														
a. Drilling Log														
b. Bomb Samples (Number Taken)														
c. Bomb Analyses														
16. Completion Data	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	
17. Survey Plat	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	C1Q	

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 CH = Standard Core Hole  
 GHT = Ground Water/Hydrologic Test Well  
 AB = Abandoned



Collection Book



## II B-2 COMPLETION DATA

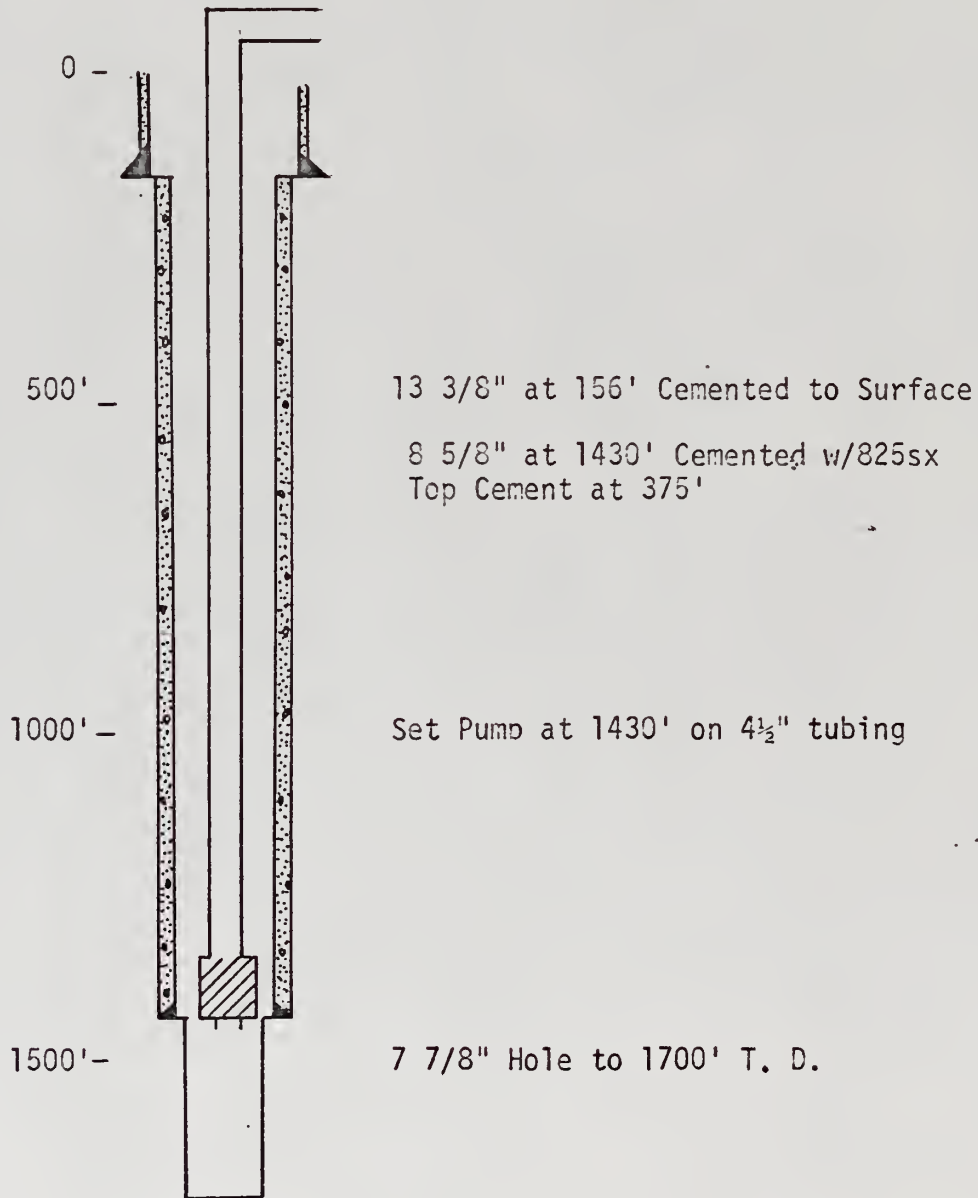
Included in this section of Quarterly Report #2 are well completion drawings for:

AT-1  
Cb-2  
SG-1  
SG-1a  
SG-8  
SG-17  
SG-20  
SG-21

Some of the tubing strings had not been perforated at the close of the second quarter.



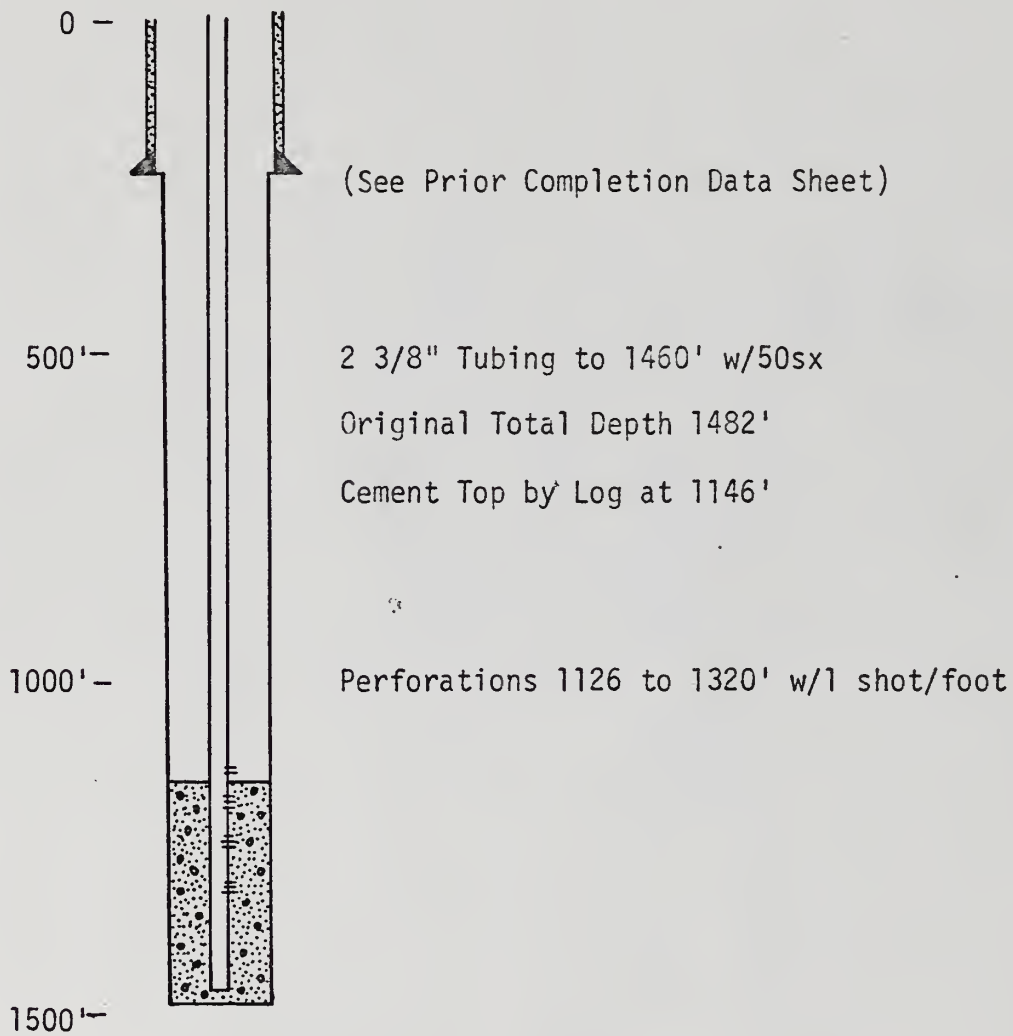
AT-1  
C-b Tract  
Section 7, 3S, 96W



Cb-2

C-b Tract

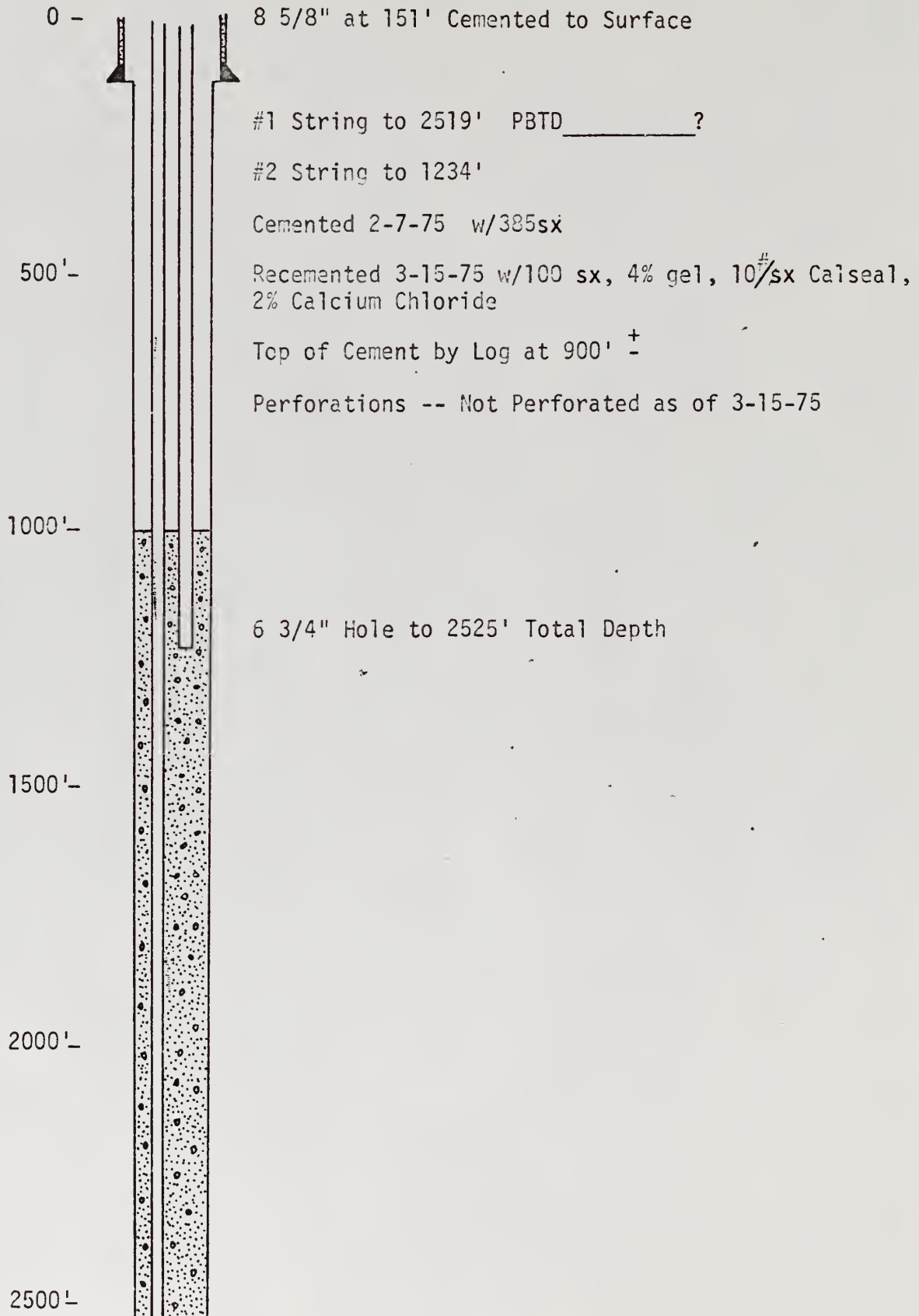
Section 6, 3S, 96W



SG - 1

C-b Tract

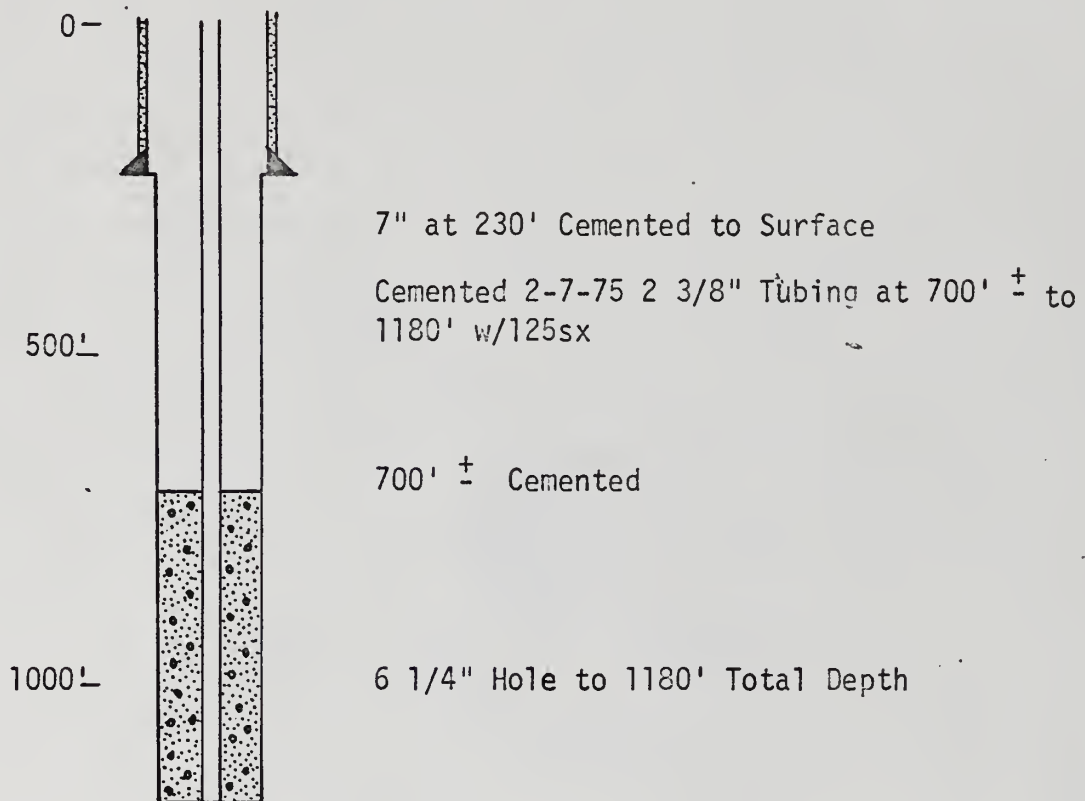
Section 2, 3S, 97W



SG - 1A

C-b Tract

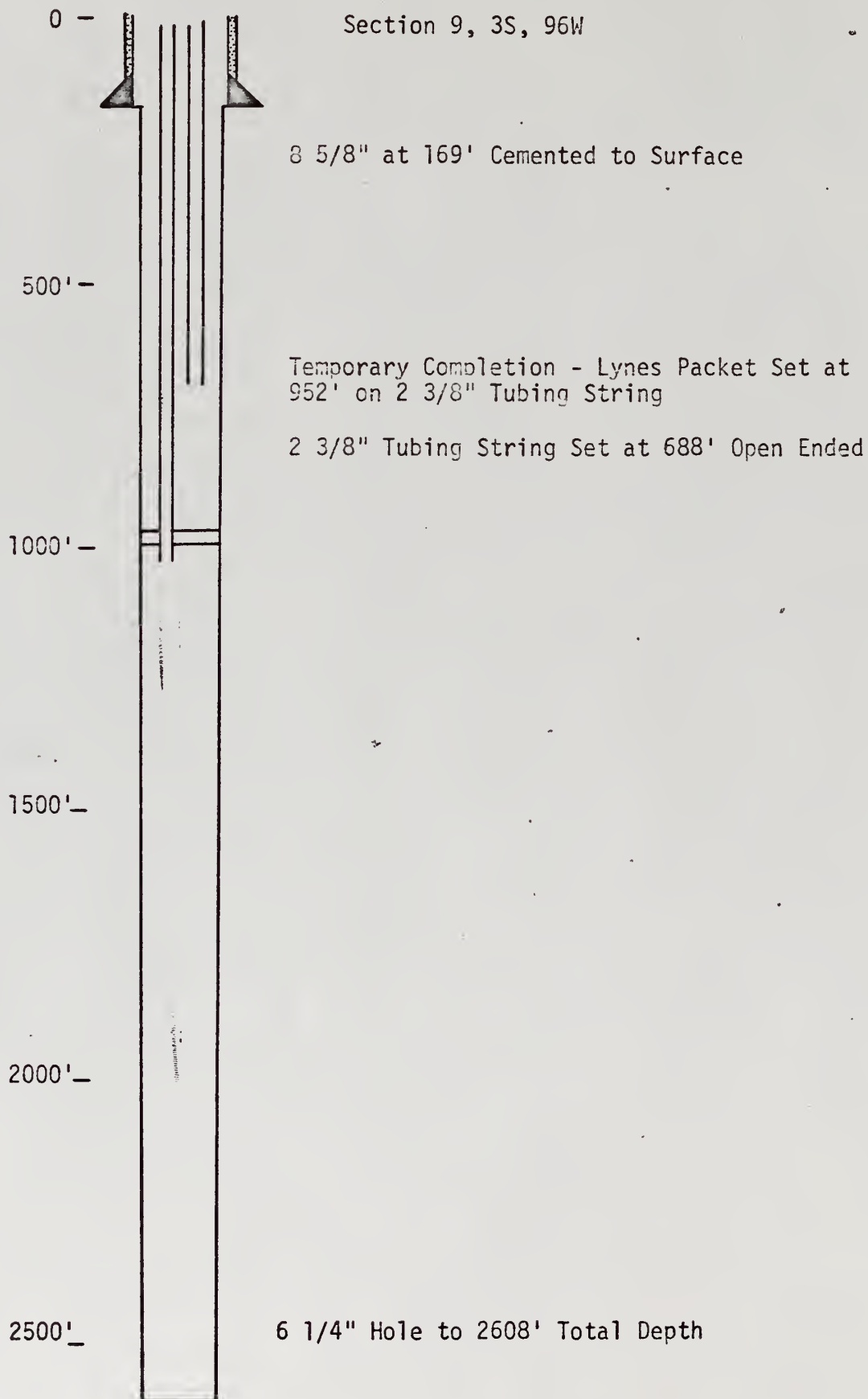
Section 2, 3S, 97W



SG-8

C-b Tract

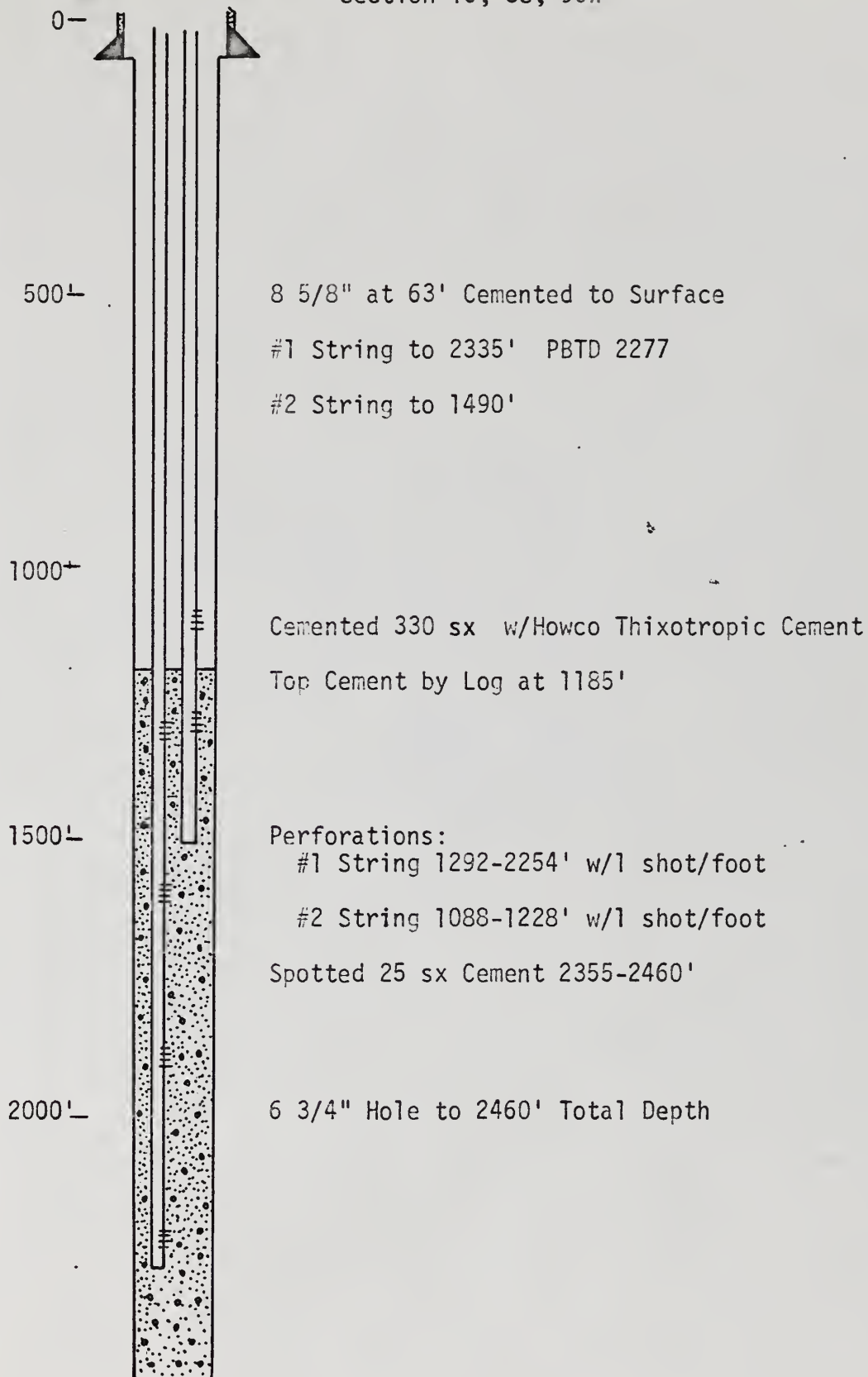
Section 9, 3S, 96W



SG - 17

C-b Tract

Section 16, 3S, 96W

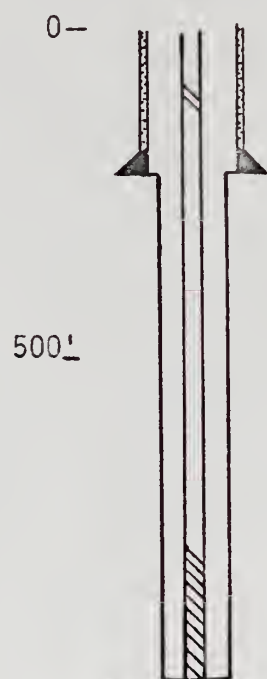




SG - 20

C-b Tract

Section 31, 2S, 96W



7" at 212' Cemented to Surface

4" at 936' Total Depth; Bottom 200 feet  
slotted.

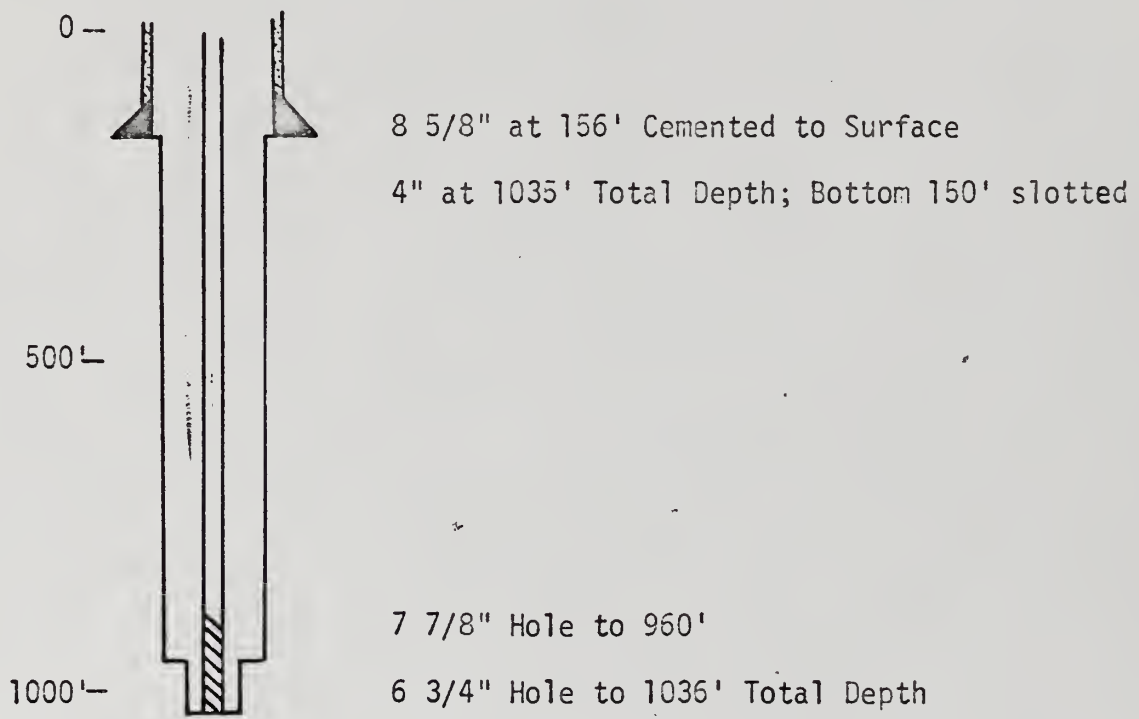
4" slotted from 100-110'

6 $\frac{1}{4}$ " hole to 987' Total Depth

SG - 21

C-b Tract

Section 13, 3S, 97W





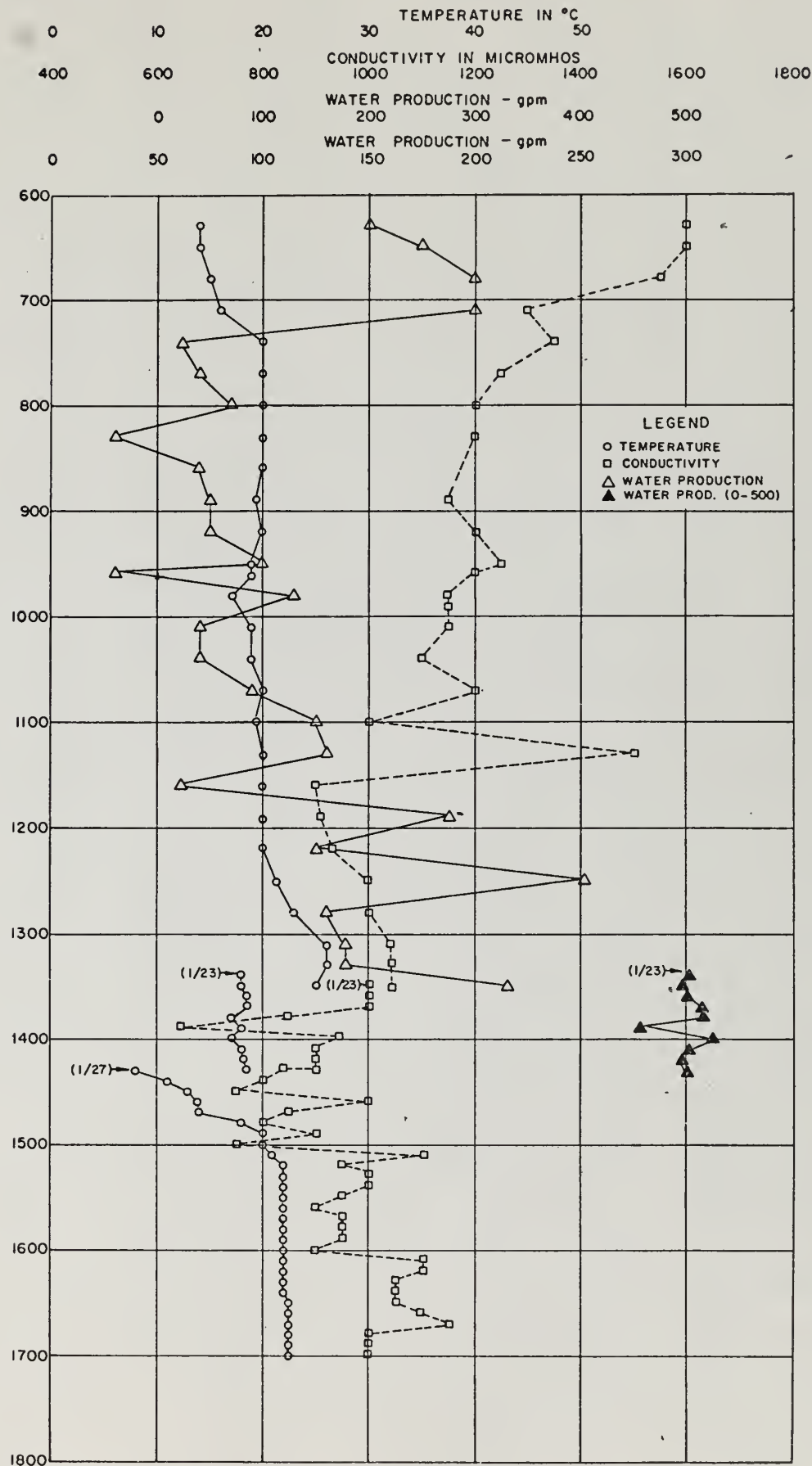


## II B-3 DRILLING WATER PRODUCTION DATA

During the drilling of wells and coreholes on and adjacent to Tract C-b, records were kept of drilling water production data. The records included produced water temperature and specific conductivity as well as produced and injected water volumes. Such readings were taken at approximately 30 foot intervals. These data are included in raw form in this section of the report.

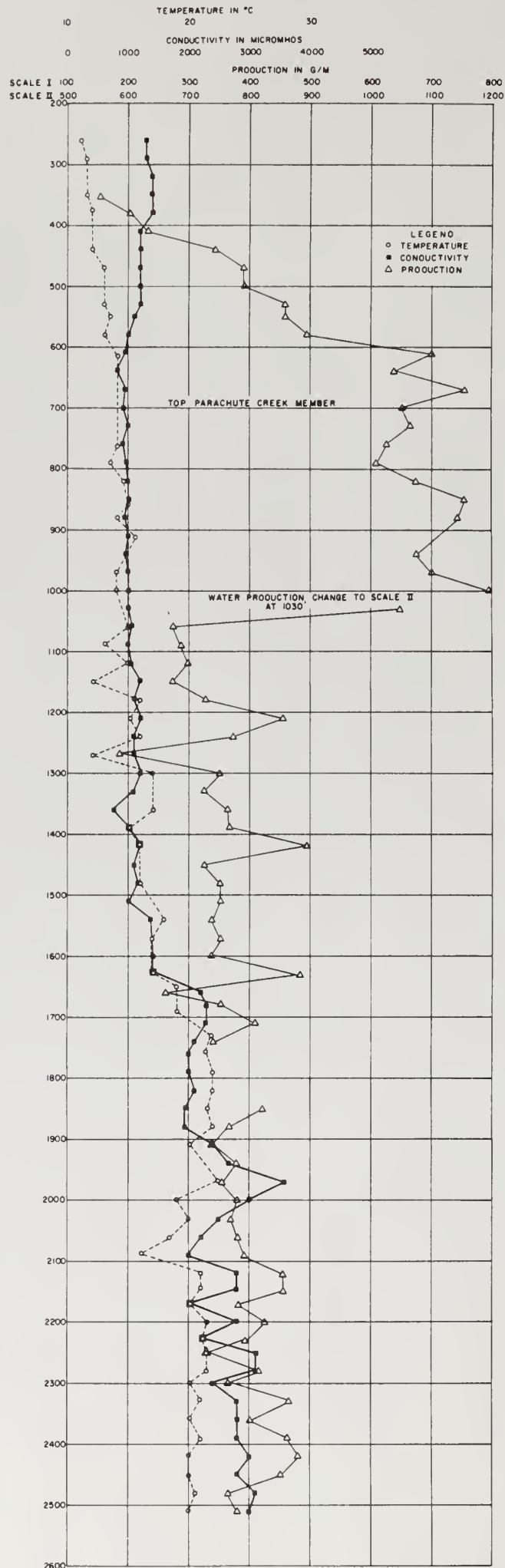
Production data for wells AT-1, SG-1, SG-1A, SG-17, SG-20 and SG-21 were accumulated during the second quarter.

# DEPTH vs TEMPERATURE, CONDUCTIVITY & WATER PRODUCTION AT-1

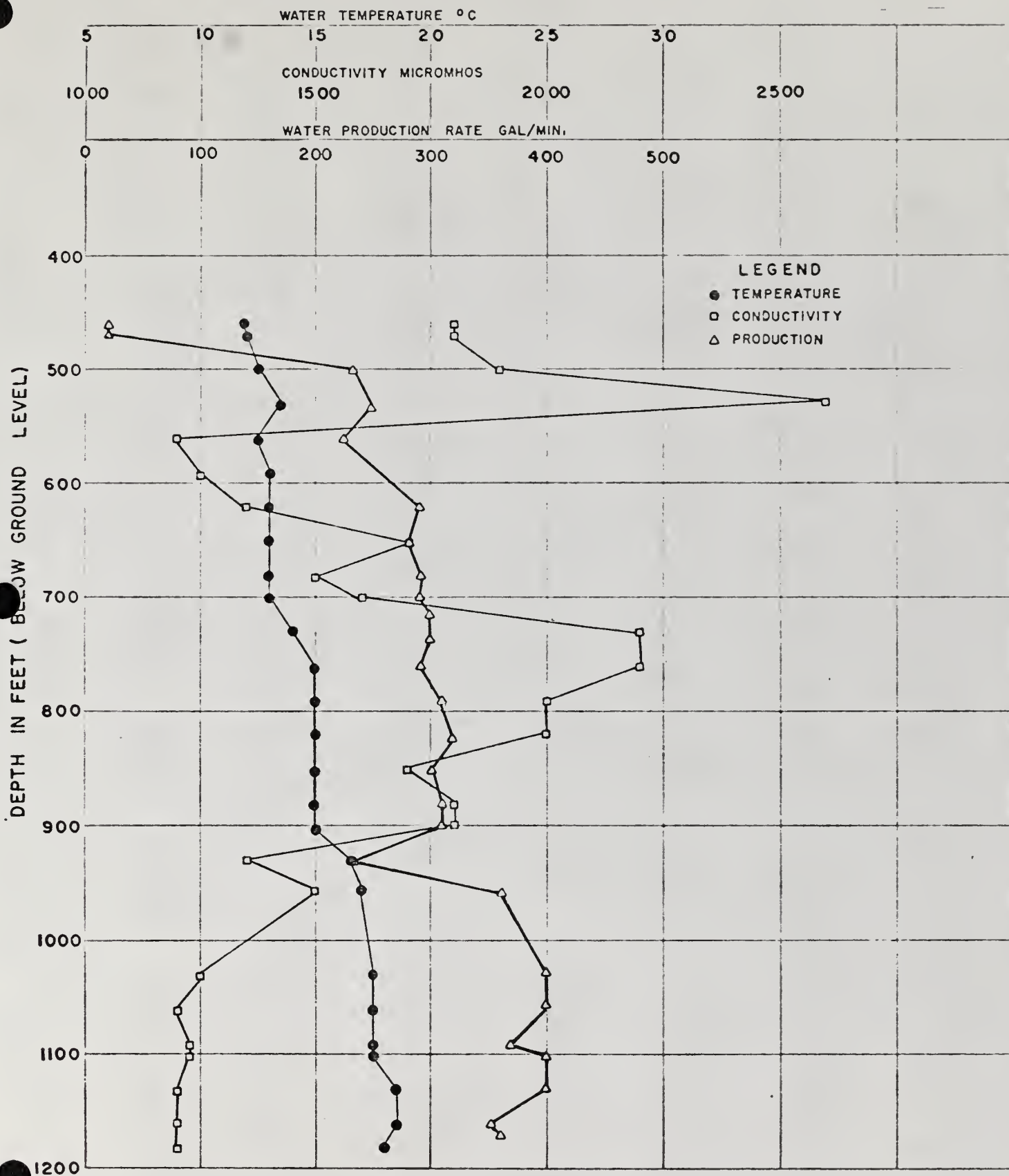




TEMPERATURE, PRODUCTION AND CONDUCTIVITY GRAPH SG-1



# TEMPERATURE, CONDUCTIVITY & PRODUCTION SG-1A

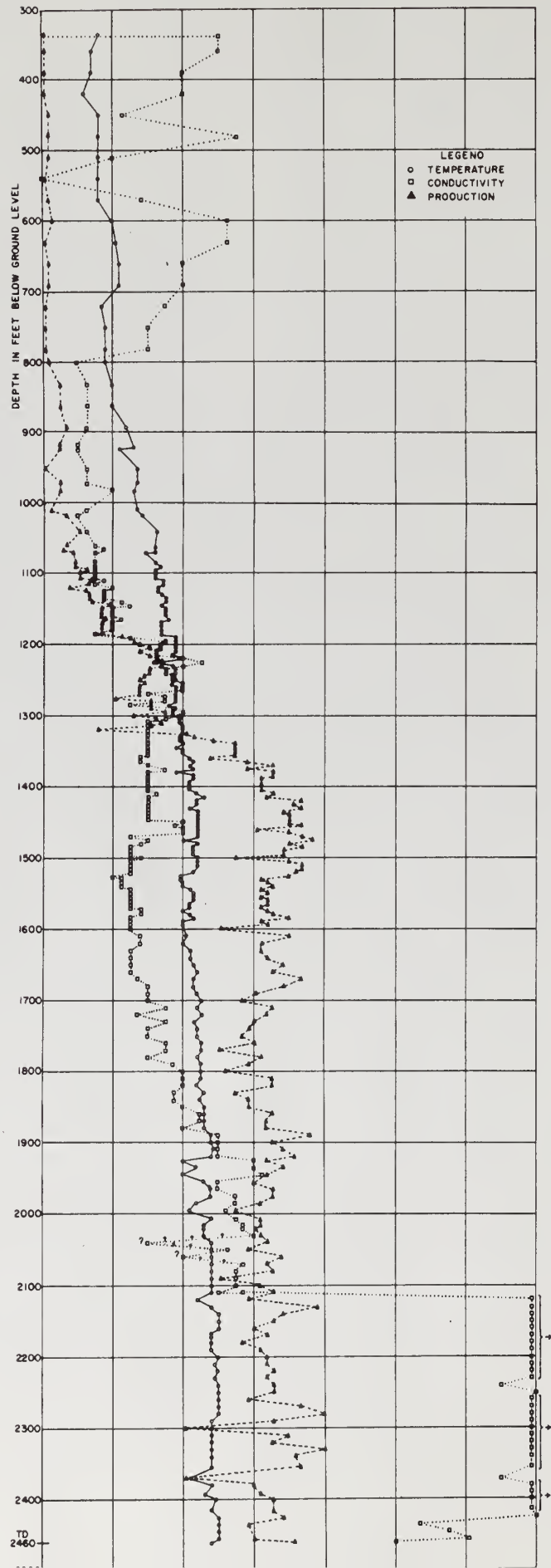


TEMPERATURE, PRODUCTION AND CONDUCTIVITY GRAPH SG-17

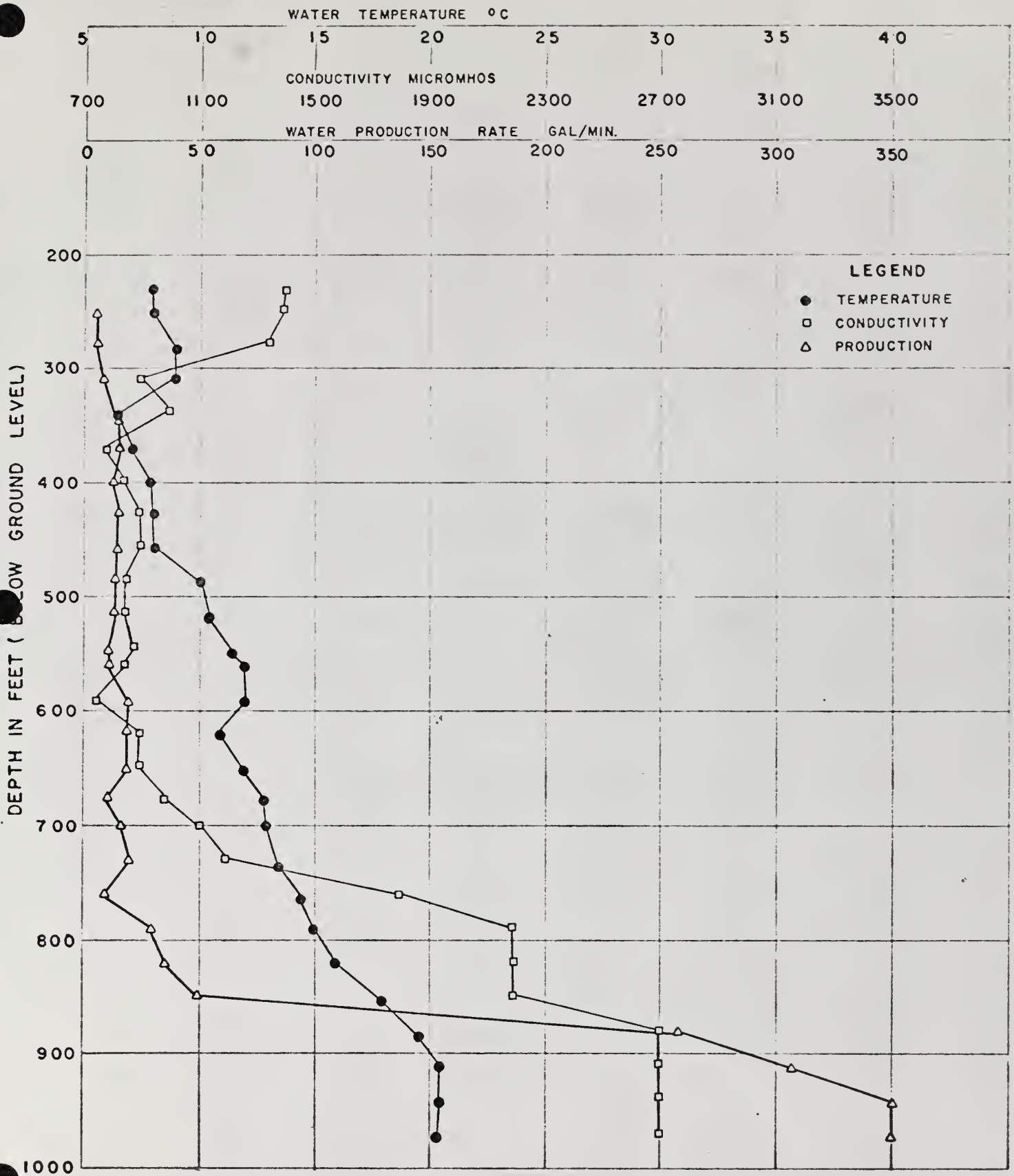
0 10 20 30 40 50 60 70  
TEMPERATURE IN °C

600 1000 1400 1800 2200 2600 3000 3200  
CONDUCTIVITY IN  $\mu$ mhos

0 100 200 300 400 500 600 700  
PRODUCTION IN G/M

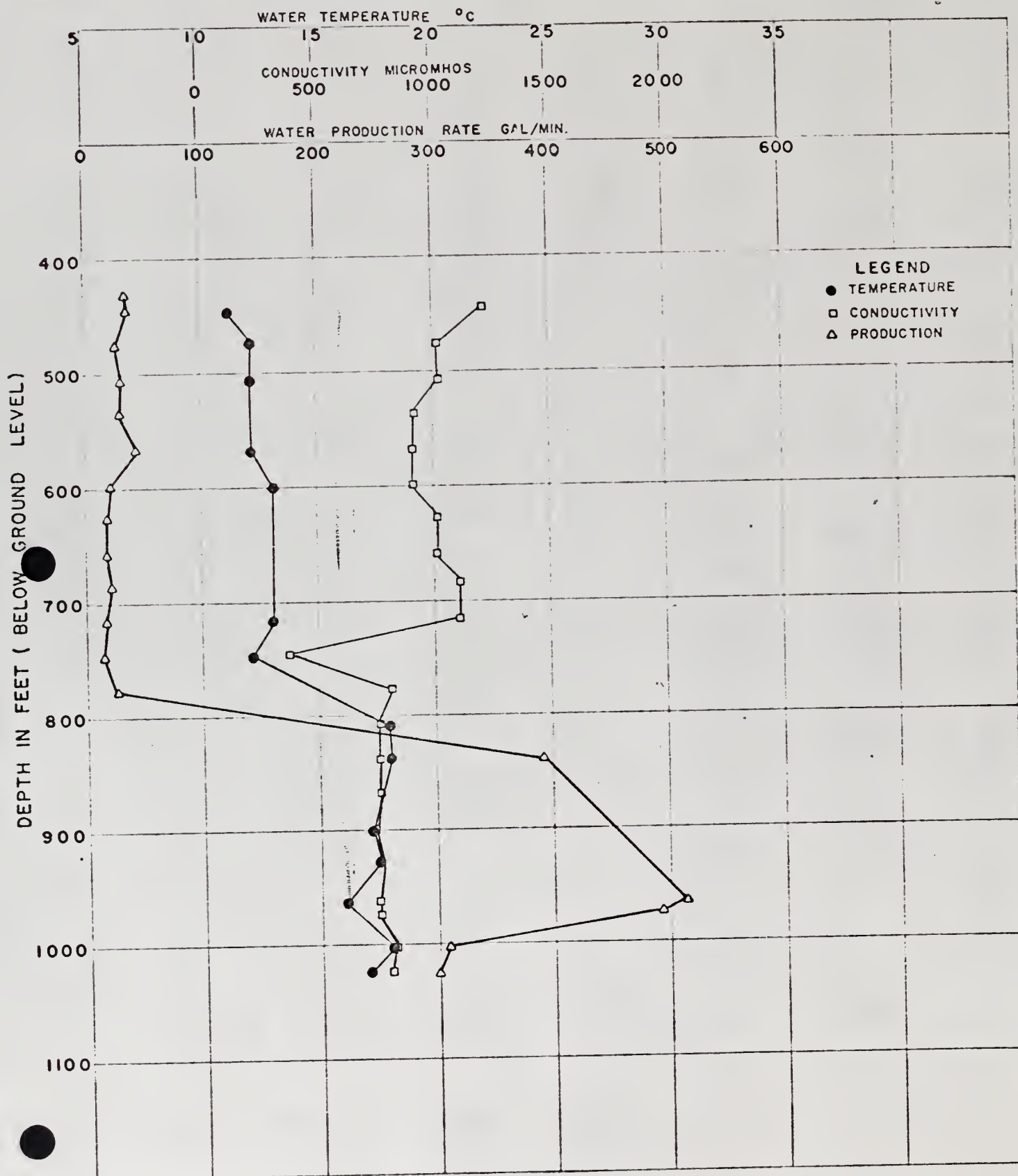


# TEMPERATURE, CONDUCTIVITY & PRODUCTION SG-20



# TEMPERATURE, CONDUCTIVITY & PRODUCTION

SG-21





# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

1940 FEL  
1314 FSL

OPERATOR ARCO WELL NAME & NUMBER SORGHUM GULCH #1 LOCATION 2-35-97W

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - gpm)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESS REMARKS
11-3	2435	260	11.0°	1300	10 gpm	6"	—		75 lbs
11-3	235	290	11.5	1300			—		75
11-3	430	320	11.5	1400			—		75
11-3	518	350	11.5	1400			32	153	125
11-3	609	380	12.0	1400			38	202	125
11-3	652	410	12.0	1200			42	233	125
11-3	725	440	12.0	1200			53	241	125
11-3	855	470	13.0	1200			58	390	210
11-3	1020	500	13.0	1200			58	390	210
11-3	1110	530	13.0	1200			64	458	200
11-3	1205	550	13.5	1100			64	458	200
11-4	340	580	13.0	1000			67	494	210
11-4	1630	610	14.0	950			84	700	325
11-6	0100	640	14.0	800			79	637	250
11-6	1720	670	14.0	950			88	754	300
11-6	2304	700	14.0	900			80	651	225
11-7	1430	730	14.0	950	12 gpm		81	664	300
11-7	2300	760	14.0	900			78	625	225
11-8	800	790	13.5	950			77	610	275
11-8	1910	820	14.5	980			82	673	400



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER SORGHUM GULCH #1 LOCATION \_\_\_\_\_

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESSURE REMARKS
11-9	35	850	15.00	1000	10	6	88	754	300
11-9	1510	880	14	930			87	740	300
11-10	920	910	15.5	1000			85	714	400
11-10	1745	940	15	1000			82	673	400
11-11	635	970	14	1000			84	700	400
11-12	335	1000	14	1000	↓		91	794	400
11-12	945	1030	14.5	1000	12		111	1046	425
11-13	1615	1060	15	1050			82	673	400
11-14	150	1090	13	1000			83	687	500
11-14	1850	1120	15	1050			84	700	450
11-15	637	1150	12	1200			82	623	450
11-15	1230	1180	16	1100			86	727	400
11-16	645	1210	15	1200			95	853	460
11-16	1605	1240	16	1100			90	771	400
11-17	1200	1270	12	1100			75	588	400
11-17	1300	1300	17	1200			88	754	325
11-17	535	1330	17	1080			86	727	420
11-18	2410	1360	17	850			89	768	600
11-18	730	1390	15	1020			89	767	600
11-19	1935	1420	16	1200	↓	✓	98	898	600

# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER 56 #1 LOCATION \_\_\_\_\_

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	REMARKS
11-20	0625	1450	16	1100	12	6"	.86	727	600
11-20	1415	1480	16	1150	12		.98	754	600
11-20	230	1510	17	1080	12		.89	754	600
11-21	1245	1540	18	1340	9.16		.87	740	400
11-21	1850	1570	17	1400	9.16		.88	753	400
11-22	0325	1600	17	1400	9		.87	740	400
11-22	1620	1630	17	1400	9		.97	884	650
11-23	0645	1660	19	2200	9		.81	664	900
11-23	1315	1680	19	2300	9		.88	754	600
11-23	1645	1700	19.5	2300	9		.92	812	600
11-24	735	1730	22	2100	9		.87	740	650
11-24	1650	1760	21.5	2000	9		1.2 ?		625
11-25	5	1790	22.	2000	9		MOVED ? FLUME ?	PH LOSSES	600
11-25	1150	1820	22.	2100	11		1. ?	924 ?	650
11-26	1000	1850	21.5	1950	11		.93	825	500
11-26	1515	1880	22.	1950	11		.89	767	625
11-26	2310	1910	20	2400	9		.87	740	670
11-27	810	1940	21.5	2650	9		.90	780	475
11-27	1210	1970	22.5	3600	9		.88	753	475
11-27	1903	2000	19.	3000	9	↓	.90	780	450

# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER 56 #1 LOCATION \_\_\_\_\_

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - gpm)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESS. REMARKS
11-28	0345	2030	20.	2500	9	6"	89	761	450
11-28	1410	2060	19.5	2200	9		90	780	475
11-30	0635	2090	16	2000			89	790	470
11-30	1530	2120	21	2800			95	852	535
11-30	1410	2145	21	2800			95	852	550
12-1	0200	2170	20	2000			90	780	520
12-1	1130	2200	21.5	2800			93	828	710
12-2	623	2230	21	2200			91	749	600
12-2	1555	2250	21.5	3100			86	727	700
12-2	1740	2280	21.5	3100			92	713	825
12-3	0550	2300	20	2400			84	767	750
12-3	1205	2330	21	2800			96	866	525
12-3	1630	2357	20	2800			84	700	660
12-4	720	2388	21	2800			96	880	800
12-4	1905	2420	20	3000			97	881	525
12-4	2300	2450	20	2800			95	852	725
12-5	1030	2480	20.5	3100			94	767	658
12-6	247	2510	20.	3000	✓	↓	90	780	750



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER SARGHAM GULCH #12 LOCATION

1975

INJECTED  
WATER  
(rate - g/m)

CONDUCTIVITY  
MICROMHOS

WATER  
TEMPERATURE

DEPTH

TIME

PRODUCTION  
RATE  
(gpm)

FLUME  
READING

FLUME  
SIZE

INJECTED  
WATER  
(rate - g/m)

CONDUCTIVITY  
MICROMHOS

WATER  
TEMPERATURE

DEPTH

TIME

REMARKS

1-14	STARTED	70	MAKE WATER @	N 300'	NOT UP				
1-14	1930	460	12	180	NOT UP	" "	" "	+20	SOAPY
1-14	2000	470	12	180	"	" "	" "	+20	SOAPY
1-15	0243	500	12.5	190	6"	.42		233.4	100
1-15	0538	530	13.5	260	6"	.44		251.3	100
1-15	0957	560	12.5	1200	"	.41		224.4	100
1-15	1315	590	13.0	1250	"	.45		251.3	100
1-15	1600	620	13.0	1350	"	.48		291.7	100
1-15	1850	650	13.0	1700	"	.47		282.7	100
1-15	2112	680	13.0	1500	"	.48		291.7	100
1-16	0026	700	13.0	1600	"	.48		291.7	100
1-16	0505	730	14.0	2200	"	.49		300.7	100
1-16	1516	760	15.0	2200	6"	.48		291.7	100
1-17	0035	790	15.0	2000	6"	.50		310	100
1-17	2145	820	15.0	2000	6"	.51		318	150
1-17	0500	850	15.0	1700	6"	.49		300.9	150
1-17	0707	880	15.0	1800	6"	.50		310	200
1-17	0920	900	15.0	1800	6"	.50		310	200
1-19	1111	930	16.5	1350	6"	.42		233	200
1-26	1135	955	17.0	1500	6"	.55		359	200



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER SORGHUM GULCH #17 LOCATION C6 TRACT AIR PRESSURE

1974  
DATE

TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate-glm)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	PSI	REMARKS
11.5	0	0C					0		
11.7	0130	8.0	1400	4.2	6"	NOT UP	± 5	125	
11.7	0255	7.0	1400	4.2	"	"	± 5	125	
11.7	0615	7.0	1200	4.2	"	"	± 5	150	
11.7	0820	6.0	1200	4.2	"	"	± 5	150	
11.7	2310	8.0	950	10.0	"	"	± 10	150	
11.8	0120	8.0	1500	10.0	"	"	± 10	125	
11.8	0310	8.0	900	10.0	"	"	± 10	150	
11.8	0525	8.0	600	10.0	"	"	± 5	150	
11.8	0725	8.0	1150	10.0	"	"	± 10	150	
11.8	0920	10.0	1450	10.0	"	.09	± 15	150	
11.8	1300	10.5	1450	10.0	"	.04	± 5	150	
11.8	1545	11.0	1200	10.0	"	.06	± 10	150	
11.8	1705	11.0	1200	10.0	"	.06	± 10	150	
11.8	1855	8.5	1100	10.0	"	.05	± 5	150	
11.8	2020	9.0	1000	10.0	"	.02	± 5	175	
11.8	2125	9.0	1000	10.0	"	.02	± 5	175	



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER SORGHUM GULCH #17 LOCATION CH-TRACT

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	REMARKS
11.8	2215	800	9.0	800	10.0	6"	.02	± 5"	175"
DEPTH CORRECTION 800' EQUALS 808'									
11.8	2255	808	10.0	750	NONE	"	.072		
11.9	0755	808	8.0	750	JETTING TEST			PROBABLY TRUE	FORMATION H <sub>2</sub> O
11.9	2225	830	10.0	850	5.0	6"	.11	27	220
11.10	1740	860	10.0	850	5.0	"	.11	27	220
11.11	2300	890	12.0	850	10.0	"	.13	36	220
11.12	0935	919	13.0	800	Hole making 27 G/m while circulating w/o soap & no injected H <sub>2</sub> O prior to DST #9 866'-919'				
11.13	0815	920	11.0	800	10.0	6"	.11	27	275"
11.13	2110	950	13.5	850	10.0	"	.01	± 5"	300
11.14	0700	970	13.5	850	10.0	"	.11	27	300
11.15	0917	980	13.0	1000	10.0	"	.11	27	225"
11.16	0539	1010	13.5	850	10.0	"	.07	± 15"	250
11.17	0823	1017	14.0	800	Hole making 36 G/m while circulating w/o soap & no injected H <sub>2</sub> O prior to DST #6				
11.17	2245	1040	16.5	850	10.0	6"	.17	54	250
11.18	0515	1062	15.5	900	Hole making 36 G/m while circulating w/o soap & no injected H <sub>2</sub> O prior to DST #17				
11.18	0955	1067	15.0	950	Hole making 31 G/m while circulating w/o soap & no injected H <sub>2</sub> O prior to DST #17				
11.19	0608	1070	14.5	900	10.0	6"	.15	45	250
11.19	1420	1085	16.0	900	8.0	"	.16	49	250
11.19	1610	1090	16.5	900	8.0	"	.16	49	250

#3  
DST, 869'

DST #5  
919'-970

Making 5' more feet of hole

OPERATOR ARCO WELL NAME & NUMBER SARGHUM GULCH #17 LOCATION C6 TRACT

1974 DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/lm)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESS PSI REMARKS
11.19	2107	1095	16.0	900	6.0	6"	.18	63	300
11.19	2320	1100	16.0	900	6.0	"	.17	54	300
11.20	0415	1105	16.0	900	6.0	"	.17	54	225
11.20	0605	1110	17.0	950	6.0	"	.20	72	250
11.20	0805	1115	17.0	900	6.0	"	.19	67	250
11.20	0930	1116.7	17.0	1000	Making 40 g/lm while circulating w/o soap & injected H <sub>2</sub> O prior to DST #8				
11.21	0347	1120	16.5	950	6.0	6"	.18	63	250
11.21	0505	1125	16.5	950	6.0	"	.19	67	250
11.21	0850	1130	17.0	950	6.0	"	.19	67	250
11.21	1015	1135	17.5	1050	6.0	"	.20	72	250
11.21	1210	1140	17.5	1050	6.0	"	.23	90	250
11.21	1915	1145	17.0	1100	6.0	"	.24	99	250
11.21	1950	1150	17.5	1000	6.0	"	.22	85	250
11.21	2120	1155	17.5	1000	6.0	"	.22	85	250
11.21	2255	1160	17.5	1000	6.0	"	.22	85	275
11.21	2340	1165	18.0	1050	6.0	"	.23	90	275
11.22	0025	1166	17.0	1100	Hole making 49 g/lm while prior to DST #9		circulating w/o soap & injected H <sub>2</sub> O		
11.22	2045	1170	17.0	1000	8.0	"	.22	85	250
11.23	0145	1175	17.6	1000	8.0	"	.22	85	250
11.23	0345	1180	17.0	1000	8.0	"	.22	85	300



OPERATOR ARCO WELL NAME & NUMBER SORGHUM GULCH #17 LOCATION CL-TRACT

1974 DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESS PSI REMARKS
11.23	0908	1180	17.0	1025	NO H <sub>2</sub> O OR SOAP COLLECT SAMPLES	6"	.18	63	250
11.23	0605	1185	17.0	900	8.0	"	.22	85	250
11.23	1125	1190	19.0	1100	8.0	"	.26	112	275
11.23	1240	1195	19.0	1300	8.0	"	.29	130	200
11.23	1400	1200	19.0	1280	8.0	"	.30	139	200
11.23	1730	1205	19.0	1280	8.0	"	.32	153	200
11.23	1910	1210	19.0	1250	8.0	"	.30	139	250
11.23	1935	1212	19.0	1400	Hole making 12 g/m while circulating w/o soap & injected H <sub>2</sub> O prior to DST #10	"	.32	153	250
11.25	0110	1215	18.5	1250	8.0	"	.32	153	250
11.25	0243	1220	20.0	1400	8.0	"	.33	162	225
11.25	0510	1224	19.0	1400	Hole making 116 g/m while circulating w/o soap & injected H <sub>2</sub> O prior to DST'S #11 and #12	"	.34	171	225
11.26	1200	1225	16.0	1500	8.0	"	.34	171	225
11.26	1400	1230	18.5	1400	8.0	"	.32	153	200
11.26	1523	1235	19.0	1300	8.0	"	.32	153	225
11.26	1630	1240	19.0	1300	8.0	"	.31	144	225
11.26	1835	1245	18.5	1350	8.0	"	.30	139	200
11.26	1930	1250	19.0	1350	8.0	"	.30	139	200
11.26	2045	1250	19.0	1350	Hole making 130 g/m while circulating w/o soap & injected H <sub>2</sub> O prior to DST #13	"	.31	144	250
11.27	2148	1255	18.5	1400	8.0	"	.30	139	250
11.27	2330	1260	19.0	1400	8.0	"	.30	139	250

OPERATOR ARCO WELL NAME & NUMBER SORGHUM GULCH #17 LOCATION C6-TRACT

1974 DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESS PSI	REMARKS
11.28	0228	1265	19.0	1400	8.0	6"	.30	139		250
11.28	0355	1270	19.0	1200	15.0	"	.30	139		325
11.28	0637	1275	19.0	1300	Hole making prior to DST #14	103 g/m while circulating w/o scope injected H <sub>2</sub> O				
11.28	1215	1280	19.0	1300	Hole making prior to DST #14	153 g/m while circulating w/o scope injected H <sub>2</sub> O				
11.29	0904	1285	18.0	1100	8.0	"	.32	153		275
11.29	0951	1290	18.5	1350	8.0	"	.32	153		300
11.29	1047	1295	18.5	1400	8.0	"	.35	175		300
11.29	1538	1300	18.5	1350	8.0	"	.29	130		300
11.29	1744	1305	19.5	1300	8.0	"	.33	162		250
11.29	1938	1309	19.5	1200	8.0	"	.34	171		300
11.29	2005	1309	19.5	✓1200	Hole making prior to DST #15	144 g/m while circulating w/o scope injected H <sub>2</sub> O				
11.30	1115	1315	20.0	1200	8.0	"	.32	153		300
12.1	0150	1320	20.0	1200	8.0	"	.21	81		300
12.1	0800	1325	20.0	1200	8.0	"	.38	202		300
12.1	1322	1330	19.5	1200	8.0	"	.40	215		300
12.1	1413	1335	19.5	1200	8.0	"	.43	242		325
12.1	1437	1336	20.0	✓1250	Hole making prior to DST #16	215 g/m while circulating w/o scope injected H <sub>2</sub> O				
12.2	1625	1340	21.0	1200	8.0	"	.46	274		250
12.2	1750	1345	19.0	1200	8.0	"	.46	274		250
12.2	2100	1350	20.0	1200	8.0	"	.46	274		275



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

6

OPERATOR ARCO WELL NAME & NUMBER SAGEHORN GULCH #17 LOCATION CB-TRACT

AIR PRESS

PRODUCTION

FLUME  
READING

FLUME  
SIZE

INJECTED  
WATER  
(rate - g/m)

CONDUCTIVITY  
MICROMHOS

WATER  
TEMPERATURE

DEPTH

TIME

DATE

PS/  
REMARKS

12.3	0005	1355	20.0	1200	8	6"	.46	274	300
12.3	0350	1360	21.0	1150	8	"	.43	242	300
12.3	0740	1365	21.5	1150	8	"	.49	291	300
12.3	0910	1370	21.0	1200	8	"	.52	328	275
12.3	1025	1374	21.5	1150	Hole making 260 g/m while circulating w/o soap & injected H <sub>2</sub> O prior to DST #17				
12.4	0500	1375	20.0	1300	8	"	.49	291	300
12.4	0900	1380	19.0	1200	8	"	.52	328	250
12.4	0923	1385	21.5	1200	8	"	.52	328	250
12.4	1005	1390	21.5	1200	8	"	.50	310	250
12.4	1109	1395	21.0	1200	8	"	.50	310	225
12.4	1147	1400	21.0	1200	8	"	.50	310	250
12.4	1222	1405	21.0	1200	8	"	.50	310	225
12.4	1513	1410	22.0	1250	11	"	.52	328	225
12.4	1622	1475	23.0	1200	11	"	.51	319	250
12.4	1750	1420	22.0	1250	Hole making 216 g/m while circulating w/o soap & injected H <sub>2</sub> O prior to DST #18				
12.5	1145	1420	21.0	1200	11	"	.56	368	225
12.5	1320	1425	22.0	1200	11	"	.55	359	225
12.5	1825	1430	21.0	1200	11	"	.56	368	300
12.5	2015	1435	22.0	1200	11	"	.53	341	400
12.5	2055	1440	22.0	1200	11	"	.54	350	325

7

OPERATOR ARCO WELL NAME & NUMBER SARGHUM GULCH #17 LOCATION CB-TRACT

[illegible]



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR Arcio WELL NAME & NUMBER Sorghum Gulch #17 LOCATION C6-Tract

DATE	TIME	DEPTH	WATER		CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/lm)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	REMARKS
			TEMPERATURE	TEMPERATURE						
12/9	1535	1510	22.0		1100	11	6"	.56	368	360
12/9		1515	22.0		1100	11	6"	.56	368	250
12/9	1815	1520	21.5		1100	11	6"	.55	359	200
12/9	1907	1522	22.0		1150	NONE	6"	.48	292	250
12/11	0627	1527	19.5		1000	11	6"	.54	350	300
12/11	0745	1530	19.5		1050	11	6"	.50	310	300
12/11	0830	1535	20.0		1050	11	6"	.51	319	275
12/11	1015	1540	20.0		1050	11	6"	.52	328	275
12/11	1127	1545	21.0		1100	11	6"	.50	310	325
12/11	1850	1550	21.5		1100	11	6"	.51	319	300
12/11	2104	1555	21.5		1100	11	6"	.50	310	300
12/11	2251	1560	21.5		1100	11	6"	.51	319	300
12/12	0312	1565	21.0		1100	11	6"	.51	319	300
12/12	0349	1570	21.0		1100	11	6"	.50	310	300
12/12	2256	1575	20.0		1150	11	6"	.51	319	260
12/13	0031	1580	21.0		1150	11	6"	.52	328	260
12/13	0324	1585	21.5		1100	11	6"	.54	350	260
12/13	0815	1590	20.0		1150	11	6"	.50	310	300
12/13	0901	1595	20.0		1150	11	6"	.51	319	300
12/13	1012	1600	20.0		1150	11	6"	.44	251	300

OPERATOR ARCO ETAL WELL NAME & NUMBER SEARHAM GULCH # 17 LOCATION C6 TRACT
1974  
DATEINJECTED  
WATER  
(rate - gpm)CONDUCTIVITY  
MICROMHOSWATER  
TEMPERATURE

DEPTH

TIME

PRODUCTION  
RATE  
(gpm)FLUME  
READINGFLUME  
SIZE

AIR

PRESSURE  
REMARKS

12.13	1235	1610	20.5	1150	11	6"	.54	350	300
12.13	1813	1620	20.0	1150	11	"	.50	310	300
12.14	2220	1630	21.0	1100	11	"	.50	310	300
12.14	2400	1640	21.0	1100	11	"	.51	319	300
12.15	0220	1650	21.5	1100	11	"	.53	341	325
12.15	0635	1660	22.0	1100	11	"	.52	328	300
12.15	1015	1670	21.5	1150	11	"	.56	308	500
12.16	0720	1680	21.5	1200?	11	"	.53	341	300
12.16	1320	1690	22.0	1200	11	"	.49	301	275
12.16	1535	1700	22.5	1200	11	"	.47	283	325
12.16	2130	1710	22.0	1300	11	"	.52	328	325
12.16	2247	1720	22.5	1150	Hole making # 26	"	319 g/m while circulating prior to	DST	325
12.17	1825	1730	21.5	1300	11	"	.49	301	250
12.18	2430	1740	22.0	1200	11	"	.48	292	325
12.18	0200	1750	22.0	1200	11	"	.49	283	325
12.18	0445	1760	22.5	1300	11	"	.49	301	325
12.18	1000	1770	22.5	1300	11	"	.44	251	300
12.18	1040	1770	22.5	1300	Hole making # 27	"	292 g/m while circulating prior to	DST	300
12.19	0605	1780	22.0	1200	8	"	.50	310	300
12.19	0855	1790	22.5	1350	8	"	.48	292	310



OPERATOR ARCO ETAL WELL NAME & NUMBER SORGHUM GULCH #17 LOCATION C6-TRACT

1974 DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	Air Pressure -REMARKS
12/19	855	1790	22.5	1350	8	6"	.48	292	310
12/19	1000	1800	22.5	1400	8	6"	.45	260	300
12/19	1600	1810	22.5	1400	8	6"	.52	328	300
12/19	1815	1820	22.0	1400	8	6"	.52	328	300
12/19	1900	1820	22.0	1400	DST# 28		.49	301	300
12/20	1700	1830	23.0	1350	8	6"	.46	274	325
12/21	0025	1840	22.5	1350	8	6"	.48	292	325
12/21	240	1850	23.0	1400	8	6"	.48	292	300
12/21	1000	1860	23.0	1500	8	6"	.52	328	325
12/21	1220	1870	23.0	1500	8	6"	.51	319	—
12/21	1250	1870	23.0	1450	DST# 29		.46	274	300
12/22	—	1880	23.0	1400	11	6"	.51	319	300
12/22	1457	1890	24.0	1600	11	6"	.57	381	325
12/22	1725	1900	24.0	1600	11	6"	.52	328	325
12/22	2120	1910	24.5	1600	11	6"	.53	341	360
12/23	555	1920	24.5	1600	11	6"	.55	359	350
12/23	620	1920	23.0	1600	DST# 30		.09	22	400
12/28	1145	Static	water level	wh pipe = 428.7 below surface					
12/29	1205	1926	20.0	1800	11	6"	.51	319	350
12/29	1440	1936	22.0	1800	11	6"	.53	341	375

OPERATOR ARCO WELL NAME & NUMBER SARGEHUM GULCH #17 LOCATION Ch-TRACT

1974

1974 DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - glm)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESS. REMARKS
12.29	1824	1946	20.0°C	1850	11	6"	.51	319	350
12.29	2135	1956	23.0	1600	11	"	.49	301	375
12.30	0105	1966	24.0	1600	11	"	.52	328	400
12.30	0210	1967	24.0	1600	NONE	"	.50	310	350
12.31	0715	1977	24.0	1700	11	"	.52	328	425
12.31	1040	1987	22.0	1700	11	"	.50	310	350
12.31	1310	1997	21.0	1650	11	"	.46	274	350
12.31	1520	2007	24.0	1700	11	"	.50	310	375
12.31	1800	2017	23.0	1750	11	"	.50	310	375
12.31	1940	2020	23.0	1750	Prep for DST # 32	"	.49	301	350
1975									
1.1	1740	2030	23.0	1800	11	"	.50	310	375
1.1	2105	2040	24.0	1200?	11	"	.51	319	350
1.1	2310	2050	24.0	1650	11	"	.48	292	350
1.2	0135	2060	24.0	1400?	11	"	.53	341	350
1.2	0455	2070	24.0	1750	11	"	.51	319	350
1.2	0525	2070	24.0	2000	Prep for DST # 33	"	.49	301	400
1.2	2040	2080	24.0	1700	11	"	.52	328	350
1.2	2230	2090	24.0	1700	11	"	.44	251	350
1.3	0045	2100	24.0	1700	11	"	.50	310	350



12

WELL NAME &amp; NUMBER:

61#98

LOCATION:

Air Pressure

OPERATOR ARC WELL NAME & NUMBER S6#17 LOCATION \_\_\_\_\_INJECTED  
WATER  
(rate - gpm)FLUME  
READINGFLUME  
SIZEINJECTED  
WATER  
(rate - gpm)CONDUCTIVITY  
MICROMHOSWATER °C  
TEMPERATURE

DEPTH

TIME

DATE

REMARKS

1/7/75	0510	2280	25.0	3600	11	6"	.58	399	375
1/7/75	0825	2290	24.0	4000	11	6"	.52	328	375
1/7/75	1025	2300	24.0	5400	11	6"	.38	202	350
1/7/75	1207	2310	24.0	3700	11	6"	.54	350	350
1/7/75	1430	2320	24.0	4000	Prep DST #36	6"	.52	378	350
1/7/75	1910	2325	24.0	3800	11	6"	.54	350	375
1/7/75	2012	2330	24.0	3800	11	6"	.58	399	350
1/7/75	2110	2335	24.0	3800	11	6"	.56	368	350
1/7/75	2355	2345	24.0	3900	11	6"	.55	359	375
1/8/75	0655	2355	24.0	3600	11	6"	.56	368	350
1/8/75	0940	2370	21.0	3200	Prep DST #36	6"	.38	202	350
1/9/75	0650	2380	24.0	5000	11	6"	.49	301	350
1/9/75	0720	2383	23.0	5200	11	6"	.50	310	350
1/9/75	0830	2393	23.0	5200	11	6"	.50	310	350
1/9/75	0945	2400	24.5	3800	11	6"	.52	328	400
1/10/75	1025	2415	24.0	4000	11	6"	.52	328	375
1/10/75	1246	2425	25.0	3400	11	6"	.53	341	375
1/10/75	1605	2435	25.0	2750	11	6"	.48	292	375
1/11/75	0145	2445	25.0	2900	11	6"	.49	301	360
1/11/75	0415	2455	25.0	3050	11	6"	.51	319	375



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER SG-20 LOCATION Cb

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	Air Pressure
12/3	1010	220'	5.5°	5000	38 gpm	6"	Not UP	5 gpm ±	50 lbs Still in Cement
12/3	1227	250	8°	1400	38		"	5 gpm ±	75 lbs
12/3	1428	280	9°	1350	38		"	7 gpm ±	50
12/3	1647	310	9°	900	30		"	15 gpm ±	50
12/3	1852	340	6.5°	1000	30		"	"	50
12/3	2035	370	7°	750	30		"	"	100
12/3	2207	400	8°	850	30		"	"	100
12/3	2305	425	8°	900	30		"	"	100
12/4	0102	455	8°	900	30	✓	"	"	100
12/4	0500	485	10°	850	30		"	"	100
12/4	0917	515	10.5°	850	32		.04	> 10 gpm	100
12/4	1736	545	11.5°	875	32		Not UP	10 ±	75
12/4	1833	560	12°	850	32		.04	> 10 gpm	100
12/4	2158	590	12°	750	50		.04	20 gpm	100
12/4	2350	620	11°	900	50		.08	18 gpm	100
12/5	0124	650	12°	900	50		.09	20 gpm	100
12/5	0454	677	13°	1000	50		.05	10 gpm	100
12/5	0821	700	13°	1100	50		.08	18 gpm	100
12/5	1202	730	13.5°	1200	50	✓	.09	20 gpm	100
12/5	1543	760	14.5°	1800	50		.05	10 gpm	125

ARCO



# WATER PRODUCTION AND CONDUCTIVITY DATA SHEET

OPERATOR ARCO WELL NAME & NUMBER Sorghum Gulch #21 LOCATION cb-TRACT

DATE	TIME	DEPTH	WATER TEMPERATURE	CONDUCTIVITY MICROMHOS	INJECTED WATER (rate - g/m)	FLUME SIZE	FLUME READING	PRODUCTION RATE (gpm)	AIR PRESSURE-REMARKS
12-15-74	1845	450	11	1200	10	6"	.12	31.4	150
12-15	2200	480	12	1000			.10	22.4	150
12-15	2240	510	12	1000			.11	26.9	150
12-15	2320	540	12	900			.11	26.9	150
12-15	2350	570	12	900			.14	40.4	150
12-16		600	13	900			.09	19.	150
12-16	152	630	13	1000			.07	15.	150
12-16	255	660	13	1000			.07	15.	150
12-16	950	690	13	1100			.08	18.	150
12-16	1326	720	13	1100			.07	15.	150
12-17	1037	750	12	3600?			.05	11.	100
12-17	1154	780	15	8000			.11	26.9	100
12-17	1314	810	18	750			reset Flume		175
12-17	1700	840	18	750			.58	390	200
12-18	0006	870	17.5	750			FLUME OUT		200
12-18	0540	900	17.	725			"	"	200
12-18	725	930	17.5	750			"	"	200
12-18	1706	966	16.	750			.69	516	400
12-18	2140	975	16.5	750			.67	493	400
12-19	500	1005	18.	800		✓	.50	309.	400
12-19	1042	1025	17.	800	✓	6"	FLUME OUT	~300%	400







## II B-4 WATER QUALITY - DRILLING WATER

During the drilling of a well or core hole, samples of the produced water are collected for analysis. Jetting test samples are collected for every well. It should be noted that the sample depth indicates the depth at which the drilling bit was located when the sample was taken. Since the samples are taken from the drilling water flow line, the data reflect a composite of conditions from surface to drilling bit depth.

Samples were also taken during drill stem tests which were conducted in some of the wells. In a drill stem test, a packer is used to isolate a portion of the well bore at some interval above the bottom of the hole and water is then jetted from the isolated interval. The sample collected should represent ground-water conditions in the discrete subsurface interval between the packer and the bottom of the well.

Tables II B-4.1 and II B-4.2 list the water samples collected from jetting tests and drill stem tests for which data are presented in Quarterly Report #2.

TABLE II B-4.1  
WATER QUALITY SAMPLES  
JETTING TESTS AND DRILL STEM TESTS

Well	Test	Sample Depth Feet
SG-1	JT	613
SG-1	JT	706
SG-1	JT	990
SG-1	JT	1105
SG-1	JT	2179
SG-1	JT	2525
SG-1	DST	lower zone (below 1930
SG-20	JT	515
SG-20	JT	850
SG-20	JT	987
SG-20	DST	945
SG-21	JT	676
SG-21	JT	980
SG-21	JT	1035
SG-21	DST	1000-1035
SG-21	DST	950-1009
SG-8	JT	600
SG-8	JT	971
SG-8	JT	1013
SG-8	JT	2117
SG-8	JT	2608
SG-8	DST	lower zone (below 1910)
SG-8	DST	upper zone (950 to surface)

JT = Jetting Tests  
DST = Drill Stem Tests

TABLE II B-4.2

Water Quality Samples Collected During The Drilling  
of SG-17

<u>Sample No.</u>	<u>Drill Stem Test No.</u>	<u>Sample Interval (Feet)</u>	<u>Sample Type</u>
1	DST 1	788-808	Environmental (1)
2		859	Minimum (2)
3	DST 3	822-869	Minimum
4	DST 4	866-919	Minimum
5	DST 5	919-970	Minimum
6	DST 6	970-1017	Minimum
7	DST 7	1015-1062	Environmental
8	DST 8	1066-1117	Environmental
9	DST 9	1115-1166	Minimum
10		1180	Minimum
11	DST 10	1164-1212	Minimum
12	DST 11	1200-1224	Minimum
13	DST 13	1224-1250	Minimum
14	DST 14	1250-1271	Minimum
15	DST 15	1280-1309	Minimum
16	DST 17	1329-1374	Minimum
17	DST 18	1374-1419	Minimum
18	DST 19	1423-1470	Minimum
19	DST 21	1473-1522	Minimum
20	DST 23	1514-1752	Minimum
21	DST 24	1561-1622	Minimum
22	DST 25	1618-1670	Minimum
23		1622	Minimum
24	DST 26	1668-1720	Minimum
25	DST 27	1711-1770	Minimum
26	DST 28	1768-1820	Minimum
27	DST 29	1818-1870	Minimum
28	DST 30	1869-1920	Minimum
29	DST 31	1918-1970	Minimum
30	DST 34	2120-2170	Environmental
31		2608	Minimum

(1) Complete chemical analysis per environmental baseline samples.

(2) Minimum analysis done.

TABLE II B 4.3

WATER QUALITY ANALYSIS  
DRILLING WATERWell Number: SG-1

Depth at Which Sample Taken		613'	706'	990'	1105'	2179'
Element Measured						
1.	Aluminum (ug/l)	.1	<.1	.4		
2.	Ammonia (mg/l)	.5	.5	.4	.4	
3.	Arsenic (ug/l)	.02	<.01	.02	(.08)	
4.	Barium (ug/l)	.2	<1	.1	<1	
5.	Beryllium (ug/l)	<.002		.001	.001	
6.	Bicarbonate (mg/l)	460	520	500	580	1330
7.	Bismuth (ug/l)	<.002		<.003	<.003	
8.	Boron (ug/l)	.4	2.7	2.8	2.3	1.9
9.	Cadmium (ug/l)	<.002	<.01	<.003	<.003	
10.	Calcium (mg/l)	16	14	13	12	16
11.	Carbonate (mg/l)	<.1	<.1	<.1	<.1	<.1
12.	Cerium (mg/l)	<.002		<.003	<.003	
13.	Chloride (mg/l)	9.6	5.5	<1	6.9	56
14.	Chrome, Hexavalent	<.01	<.01	<.01	<.01	
15.	Cobalt (ug/l)	.001		.006	.01	
16.	Conductivity, Specific (uS)	980	940	980	980	
17.	Copper (ug/l)	.08	<.1	.1	.06	
18.	Fluoride (mg/l)	9.8	9.9	10.2	10	14
19.	Gallium (ug/l)	.002		<.003	.003	
20.	Hardness, Total	130	120	100	92	
21.	Hydroxide (mg/l)	<.1	<.1	<.1	<.1	
22.	Iron (ug/l)	.01	<.05	.1	.4	
23.	Lead (ug/l)	<.01	<.05	.01	.03	
24.	Lithium (ug/l)	.4	<.1	.4	.1	
25.	Magnesium (mg/l)	22	20	17	15	11
26.	Manganese (ug/l)	.01	<.05	.05	.04	
27.	Mercury (ug/l)					
28.	Molybdenum (ug/l)	.02		.01	.03	
29.	Nickel (ug/l)	.04		.02	.02	
30.	Nitrate (mg/l)	<.1	.2	.9	.5	
31.	pH	8.0	8.0	7.9	7.9	
32.	Phosphate, Total	.1	<.1	<.1	<.1	
33.	Potassium (mg/l)					<1
34.	Selenium (ug/l)	<.002	<.01	<.003	(.08)	
35.	Silica (mg/l)	15	14	13	15	13
(*) 36.	Silver (ug/l)	<.002	<.05	<.003	<.003	
37.	Sodium (mg/l)	200	210	200	250	610
38.	Solids, Dissolved (mg/l)	625	625	585	685	1580
39.	Strontium (ug/l)	.8		.2	.2	
40.	Sulfate (mg/l)	120	100	83	92	205
41.	Titanium (ug/l)	.1		.03	.2	
42.	Vanadium (ug/l)	.004		.001	.002	
43.	Yttrium (mg/l)	<.002		<.003	<.003	
44.	Zinc (ug/l)	.01	<.05	.05	.04	
45.	Zirconium (ug/l)	<.002		<.003	<.003	
46.	Radioactivity					
	Gross Alpha (pCi)	11		0	9.7	
	Radium 226*	0			3	
	Gross Beta (pCi)	0		0	0	
	Thorium 230**					
	Uranium**					
47.	Total Organic Carbon (TOC)					
	If TOC > 10 mg/l then measure					
	Dissolved Organic Carbon	<1		<1	<1	
	Suspended Organic Carbon					
	Phenol					
	Sulfur, Acid Extract					
	Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B 4.3 (Continued)  
WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-1

Depth at Which Sample Taken		2525'	Lower 1930'		
Element Measured					
1.	Aluminum (ug/l)		.2		
2.	Ammonia (mg/l)		36		
3.	Arsenic (ug/l)		.02		
4.	Barium (ug/l)		.5		
5.	Beryllium (ug/l)		.001		
6.	Bicarbonate (mg/l)	1280	6110		
7.	Bismuth (ug/l)		<.003		
8.	Boron (ug/l)	2.0	3.3		
9.	Cadmium (ug/l)		<.003		
10.	Calcium (mg/l)	20	44		
11.	Carbonate (mg/l)	<.1	170		
12.	Cerium (mg/l)		<.003		
13.	Chloride (mg/l)	43	1330		
14.	Chromium, hexavalent		<.01		
15.	Cobalt (ug/l)		.009		
16.	Conductivity, Specific (uV)		10,800		
17.	Copper (ug/l)		.05		
18.	Fluoride (mg/l)	14	10		
19.	Gallium (ug/l)		.01		
20.	Hardness, Total		225		
21.	Hydroxide (mg/l)		<.1		
22.	Iron (ug/l)		.12		
23.	Lead (ug/l)		.10		
24.	Lithium (ug/l)		.12		
25.	Magnesium (mg/l)	13	28		
26.	Manganese (ug/l)		.07		
27.	Mercury (ug/l)		.06		
28.	Molybdenum (ug/l)		.1		
29.	Nickel (ug/l)		.1		
30.	Nitrate (mg/l)		8.5		
31.	pH		<.1		
32.	Phosphate, Total		<.1		
33.	Potassium (mg/l)	<1			
34.	Selenium (ug/l)		<.003		
35.	Silica (mg/l)	13	15		
(*) 36.	Silver (ug/l)		<.003		
37.	Sodium (mg/l)	550	3390		
38.	Solids, Dissolved (mg/l)	1435	8380		
39.	Strontium (ug/l)		5		
40.	Sulfate (mg/l)	150	400		
41.	Titanium (ug/l)		.2		
42.	Vanadium (ug/l)		.06		
43.	Yttrium (mg/l)		.002		
44.	Zinc (ug/l)		.03		
45.	Zirconium (ug/l)		.1		
46.	Radioactivity				
	Gross Alpha (pCi)				
	Radium 226*				
	Gross Beta (pCi)				
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure				
	Dissolved Organic Carbon				
	Suspended Organic Carbon				
	Phenols				
	Sulfur, 7% Acid Extract				
	Nitrogen, 10% Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).



TABLE 11 B 4.4  
WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-20

Depth at Which Sample Taken	515'	850'	987'	945'	
Element Measured					
1. Aluminum (ug/l)					
2. Ammonia (mg/l)					
3. Arsenic (ug/l)					
4. Barium (ug/l)					
5. Beryllium (ug/l)					
6. Bicarbonate (mg/l)	500	1380	1760	1911	
7. Bismuth (ug/l)					
8. Boron (ug/l)	0.1	2.5	1.4		
9. Cadmium (ug/l)					
10. Calcium (mg/l)	7.4	6.6	7.4	4.9	
11. Carbonate (mg/l)	<1	<1	<1	24	
12. Cerium (mg/l)					
13. Chloride (mg/l)	4.2	9.8	9.8	13	
14. Chrome, hexavalent					
15. Cobalt (ug/l)					
16. Conductivity, Specific (uM)					
17. Copper (ug/l)					
18. Fluoride (mg/l)	3.6	19	24	23	
19. Gallium (ug/l)					
20. Hardness, Total					
21. Hydroxide (mg/l)					
22. Iron (ug/l)					
23. Lead (ug/l)					
24. Lithium (ug/l)					
25. Magnesium (mg/l)	3.5	5.2	6.2	3.0	
26. Manganese (ug/l)					
27. Mercury (ug/l)					
28. Molybdenum (ug/l)					
29. Nickel (ug/l)					
30. Nitrate (mg/l)					
31. pH				8.4	
32. Phosphate, Total					
33. Potassium (mg/l)	<1	<1	<1	.9	
34. Selenium (ug/l)					
35. Silica (mg/l)	15	15	11	11	
(*) 36. Silver (ug/l)					
37. Sodium (mg/l)	190	530	680	780	
38. Solids, Dissolved (mg/l)	525	1280	1605		
39. Strontium (ug/l)					
40. Sulfate (mg/l)	56	14	<4	<4	
41. Tantalum (ug/l)					
42. Vanadium (ug/l)					
43. Yttrium (mg/l)					
44. Zinc (ug/l)					
45. Zirconium (ug/l)					
46. Radioactivity					
Gross Alpha (pCi)					
Radium 226*					
Gross Beta (pCi)					
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l/l then measure					
Dissolved Organic Carbon					
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B 4.5  
WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-21

Depth at Which Sample Taken		676'	980'	1035'	1000-1035'	950-1009'
Element Measured						
1.	Aluminum (mg/l)					
2.	Ammonia (mg/l)					
3.	Arsenic (ug/l)					
4.	Barium (ug/l)					
5.	Beryllium (ug/l)					
6.	Bicarbonate (mg/l)	422	530	360	500	470
7.	Bismuth (ug/l)					
8.	Boron (ug/l)		< 1	.6	.6	.3
9.	Cadmium (ug/l)					
10.	Calcium (mg/l)	31	7.4	7.4	8.2	34
11.	Carbonate (mg/l)	6	12	50	< .1	< .1
12.	Cerium (mg/l)					
13.	Chloride (mg/l)	3.2	5.6	82	1.4	7.0
14.	Chrome, Hexavalent					
15.	Cobalt (ug/l)					
16.	Conductivity, Specific (uS)	750				
17.	Copper (ug/l)					
18.	Fluoride (mg/l)	1.4	16	16	16	4.9
19.	Gallium (ug/l)					
20.	Hardness, Total			32		
21.	Hydroxide (mg/l)					
22.	Iron (ug/l)			< .05		
23.	Lead (ug/l)					
24.	Lithium (ug/l)					
25.	Magnesium (mg/l)	26	3.8	3.3	7.2	33
26.	Manganese (ug/l)					
27.	Mercury (ug/l)					
28.	Molybdenum (ug/l)					
29.	Nickel (ug/l)					
30.	Nitrate (mg/l)			< .1		
31.	pH	8.4		8.5		
32.	Phosphate, Total			< .1		
33.	Potassium (mg/l)	.4	< 1		< 1	< 1
34.	Selenium (ug/l)					
35.	Silica (mg/l)	23	18	12	13	19
(*) 36.	Silver (ug/l)					
37.	Sodium (mg/l)	160	230	240	400	135
38.	Solids, Dissolved (mg/l)	581	555	610	1150	590
39.	Strontium (ug/l)					
40.	Sulfate (mg/l)	124	< 1	18	455	125
41.	Titanium (ug/l)					
42.	Vanadium (ug/l)					
43.	Yttrium (mg/l)					
44.	Zinc (ug/l)					
45.	Zirconium (ug/l)					
46.	Radioactivity					
	Gross Alpha (pCi)					
	Radium <sup>226</sup>					
	Gross Beta (pCi)					
	Thorium <sup>230</sup> **					
	Uranium**					
47.	Total Organic Carbon (TOC)					
	If TOC > 10 mg/l then measure					
	Dissolved Organic Carbon					
	Suspended Organic Carbon					
	Phenol					
	Sulfur, Acid Extract					
	Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B-4.6

WATER QUALITY ANALYSIS  
DRILLING WATERWell Number: SG-8

Depth at Which Sample Taken		600'	971'	1013'	2117'	2608'
Element Measured						
1.	Aluminum (ug/l)	.1	.2			
2.	Ammonia (mg/l)	.3	1.1			
3.	Arsenic (mg/l)	.004	.05			
4.	Barium (ug/l)	.03	.2			
5.	Beryllium (ug/l)	<.004	<.002			
6.	Bicarbonate (mg/l)	510	1010	932	1632	1808
7.	Bismuth (ug/l)	<.004	<.002			
8.	Boron (ug/l)	2.5	1	2.8		
9.	Cadmium (ug/l)	<.004	<.002			
10.	Calcium (mg/l)	23	6.6	8.3	4.5	3.3
11.	Carbonate (mg/l)	<.1	<.1	48	55	42
12.	Cerium (mg/l)	<.004	<.002			
13.	Chloride (mg/l)	6.9	6.9	3	18	19
14.	Chromium, Hexavalent	<.01	<.01			
15.	Cobalt (ug/l)	<.004				
16.	Conductivity, Specific (uv)	990	1650	1460	2300	2300
17.	Copper (ug/l)	<.1	.04			
18.	Fluoride (mg/l)	9.2	12	19	20	21
19.	Gallium (ug/l)	<.004	<.002			
20.	Hardness, Total	190	48			
21.	Hydroxide (mg/l)	<.1	<.1			
22.	Iron (ug/l)	.05	.06			
23.	Lead (ug/l)	<.02	<.01			
24.	Lithium (ug/l)	.3	.3	.05		
25.	Magnesium (mg/l)	35	7.7	4.5	2.6	1.5
26.	Manganese (ug/l)	.009	.01			
27.	Mercury (ug/l)					
28.	Molybdenum (ug/l)	.02	.02			
29.	Nickel (ug/l)	.007	.04			
30.	Nitrate (mg/l)	.6	.3			
31.	pH	8.1	8.1	9.3	8.9	8.8
32.	Phosphate, Total	<.1	<.1			
33.	Potassium (mg/l)	.4	.6	.7	1.8	.9
34.	Selenium (ug/l)	<.004	.003			
35.	Silica (mg/l)	19	11	11	13	14
(*) 36.	Silver (ug/l)	<.004	.004			
37.	Sodium (mg/l)	170	350	459	724	784
38.	Solids, Dissolved (mg/l)	600	940	920	1662	1786
39.	Silicon (ug/l)	.7	.2			
40.	Sulfate (mg/l)	85	<.4	6	23	14
41.	Titanium (ug/l)	.1	.2			
42.	Vanadium (ug/l)	<.004	<.001			
43.	Yttrium (ug/l)	<.004	<.002			
44.	Zinc (ug/l)	.01	.02			
45.	Zirconium (ug/l)	<.004	<.002			
46.	Radioactivity					
	Gross Alpha (pc/l)	2.6	.8			
	Radium 226*					
	Gross Beta (pc/l)	0	0			
	Thorium 230**					
	Uranium**					
47.	Total Organic Carbon (TOC)					
	If TOC > 10 mg/l/l then measure					
	Dissolved Organic Carbon	<1	<1			
	Suspended Organic Carbon					
	Phenol					
	Sulfur, Acid Extract					
	Nitrogen, Free Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pc/l).

\*\* Required if gross beta is greater than 100 picocuries per liter (pc/l).

a. Upper zone jetted sample

b. Lower zone jetted sample - total depth open hole



TABLE II B-4.6 (Continued)

WATER QUALITY ANALYSIS  
DRILLING WATERWell Number: SG-8

Depth at Which Sample Taken		<sup>b</sup> 1910'	<sup>a</sup> 950'			
Element Measured						
1.	Aluminum (ug/l)	.2	.2			
2.	Ammonia (mg/l)	21	3.3			
3.	Arsenic (ug/l)	.03	.03			
4.	Barium (ug/l)	2	7			
5.	Beryllium (ug/l)	< .001	< .001			
6.	Bicarbonate (mg/l)	5210	1740			
7.	Bismuth (ug/l)	< .004	< .004			
8.	Boron (ug/l)	< 35	3.6			
9.	Cadmium (ug/l)	.04	< .004			
10.	Calcium (mg/l)	12	12			
11.	Carbonate (mg/l)	96	72			
12.	Cerium (mg/l)	< .004	< .004			
13.	Chloride (mg/l)	840	55			
14.	Chromium, Hexavalent	< .05	< .05			
15.	Cobalt (ug/l)	< .01	< .02			
16.	Conductivity, Specific (uS)	9200	2500			
17.	Copper (ug/l)	.02	.02			
18.	Fluoride (mg/l)	20	12			
19.	Gallium (ug/l)	.004	.01			
20.	Hardness, Total	36	80			
21.	Hydroxide (mg/l)	< .1	< .1			
22.	Iron (ug/l)	.34	.31			
23.	Lead (ug/l)	.02	< .02			
24.	Lithium (ug/l)	6.6	.6			
25.	Magnesium (mg/l)	1.5	12			
26.	Manganese (ug/l)	.09	.004			
27.	Mercury (ug/l)	< .01	< .01			
28.	Molybdenum (ug/l)	.03	.03			
29.	Nickel (ug/l)	.2	.03			
30.	Nitrate (mg/l)	.3	0.2			
31.	pH	8.4	8.5			
32.	Phosphate, Total	< .1	< .1			
33.	Potassium (mg/l)	14	1.3			
34.	Selenium (ug/l)	< .004	< .004			
35.	Silica (mg/l)	17	12			
(*) 36.	Silver (ug/l)	< .004	< .004			
37.	Sodium (mg/l)	2600	690			
38.	Solids, Dissolved (mg/l)	6130	1670			
39.	Strontium (ug/l)	1	7			
40.	Sulfate (mg/l)	3.0	2.5			
41.	Titanium (ug/l)	.1	.05			
42.	Vanadium (ug/l)	.01	.01			
43.	Zirconium (ug/l)	.002	< .004			
44.	Zinc (ug/l)	.1	.3			
45.	Zirconium (ug/l)	.03	.006			
46.	Radioactivity					
	Gross Alpha (pCi)	24	2.1			
	Radium <sup>226</sup>					
	Gross Beta (pCi)	0	0			
	Thorium <sup>230</sup>					
	Uranium <sup>238</sup>					
47.	Total Organic Carbon (TOC)					
	If TOC > 10 mg/l then measure					
	Dissolved Organic Carbon	3	< 1			
	Suspended Organic Carbon					
	Phenol					
	Sulfur, Acid Titrable					
	Nitrogen, Kjeldahl					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

a. Upper zone jetted sample

b. Lower zone jetted sample - total depth open hole

TABLE II B 4.7

WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-17

Sample Number	1	2	3	4	5
Sampling Depth	788'-808'	859'	822'-869'	866'-919'	919'-970'
Element Measured					
1. Aluminum (ug/l)	.15	.15	.25		
2. Arsenic (ug/l)	.5	.5	.7		
3. Barium (ug/l)	.008	<.01	<.01		
4. Beryllium (ug/l)	.03	<1	<1		
5. Bismuth (ug/l)	.003				
6. Bicarbonate (mg/l)	430	440	490	495	533
7. Boron (ug/l)	<.005				
8. Cadmium (ug/l)	2.3	2.7	2.3		
9. Calcium (mg/l)	<.003	<.01	<.01		
10. Carbonate (mg/l)	4.9	4.5	5.3	3.2	10
11. Cerium (mg/l)	<.1	<.1	<.1	10	0
12. Chloride (mg/l)	<.005				
13. Chromium, Hexavalent	<1	6.9	6.9	2.3	4.1
14. Cobalt (ug/l)	<.01	<.01	<.01		
15. Conductivity, Specific (uM)	.004				
16. Copper (ug/l)	680	750	800	700	770
17. Fluoride (mg/l)	.2	<.1	<.1		
18. Gallium (ug/l)	10	10	11	15.3	13.5
19. Hardness, Total	.003				
20. Hydroxide (mg/l)	18	20	21		
21. Iron (ug/l)	<.1	<.1	<.1		
22. Lead (ug/l)	.65	1.4	1.5		
23. Lithium (ug/l)	.22	<.05	.18		
24. Magnesium (mg/l)	.8	<.5	<.5		
25. Manganese (ug/l)	.7	2.1	1.9	2.7	6
26. Mercury (ug/l)	.2	<.05	<.05		
27. Molybdenum (ug/l)					
28. Nickel (ug/l)	.03				
29. Nitrate (mg/l)	.03				
30. pH	1.9	.4	<.1		
31. Phosphate, Total	7.9	8.2	7.9	8.6	8.2
32. Potassium (mg/l)	<.1	<.1	.2		
33. Selenium (ug/l)		<.1	<.1	.4	1.1
34. Silica (mg/l)	.2	<.01	<.01		
35. Silver (ug/l)	16	17	14	13	11
(*) 36. Sodium (mg/l)	<.003	<.05	<.05		
37. Solids, Dissolved (mg/l)	180	180	200	214	211
38. Strontium (ug/l)	420	440	500	503	564
39. Sulfate (mg/l)	.5				
40. Titanium (ug/l)	<4	<4	<4	<4	4.6
41. Vanadium (ug/l)	.1				
42. Yttrium (mg/l)	.002				
43. Zinc (ug/l)	<.003				
44. Zirconium (ug/l)	.4	<.5	<.5		
45. Radioactivity	<.003				
Gross Alpha (pCi)	1.3				
Radium 226**					
Gross Beta (pCi)	0				
Thorium 230**					
Uranium**					
46. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure					
Dissolved Organic Carbon	6				
Suspended Organic Carbon					
Benzene					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).



TABLE II B 4.7 (Continued)

WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-17

Sample Number	6	7	8	9	10
Sampling Depth	970'-1017'	1015'-1062'	1066-1117'	1115-1166'	1180'
Element Measured					
1. Aluminum (ug/l)	<.1	.7	.7		
2. Ammonia (mg/l)	.7	.9	.2		
3. Arsenic (ug/l)	<.01	.1	.02		
4. Barium (ug/l)	<1	.02	.03		
5. Beryllium (ug/l)		<.002	<.001		
6. Bicarbonate (mg/l)	620	580	615	711	510
7. Bismuth (ug/l)		<.002	<.002		
8. Boron (ug/l)	2.0	1.2	1.4		<9.1
9. Cadmium (ug/l)	<.01	<.002	<.002		
10. Calcium (mg/l)	3.3	3.7	4.9	2.2	8.2
11. Carbonate (mg/l)	<.1	<.1	.72	16	66
12. Cerium (mg/l)		<.002	<.002		
13. Chloride (mg/l)	4.1	4.1	28	2.3	<4
14. Chrome, Hexavalent	<.01	<.01	<.01		
15. Cobalt (ug/l)		.001	.008		
16. Conductivity, Specific (uM)	950	910	920	1000	
17. Copper (ug/l)	<.1	.2	.08		
18. Fluoride (mg/l)	12	12	16	16	10
19. Gallium (ug/l)		.002	<.002		
20. Hardness, Total	19	18	26		
21. Hydroxide (mg/l)	<.1	<.1	<.1		
22. Iron (ug/l)	.54	.33	.5		
23. Lead (ug/l)	.08	.02	.3		
24. Lithium (ug/l)	<.5	<.5	.01		
25. Magnesium (mg/l)	2.6	2.1	5.3	2.1	8.2
26. Manganese (ug/l)	<.05	.1	.06		
27. Mercury (ug/l)					
28. Molybdenum (ug/l)		.02	.02		
29. Nickel (ug/l)		.002	.008		
30. Nitrate (mg/l)	<.1	1.9	.1		
31. pH	8.1	8.1	8.3	8.8	
32. Phosphate, Total	<.1	<.1	.1		
33. Potassium (mg/l)			.4	.5	<1
34. Selenium (ug/l)	<.01	.1	.03		
35. Silica (mg/l)	14	13	13	9	14
(*) 36. Silver (ug/l)	<.05	<.002	<.002		
37. Sodium (mg/l)	250	220	315	303	245
38. Solids, Dissolved (mg/l)	600	540	750	704	600
39. Strontium (ug/l)		.09	.4		
40. Sulfate (mg/l)	<4	<4	<4	5	<4
41. Titanium (ug/l)		.07	.3		
42. Vanadium (ug/l)		<.001	<.001		
43. Yttrium (mg/l)		<.002	<.002		
44. Zinc (ug/l)	.7	.2	.2		
45. Zirconium (ug/l)		<.002	<.002		
46. Radioactivity					
Gross Alpha (pCi)		4.5	1.7		
Radium 226**		.3			
Gross Beta (pCi)		0	15		
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure					
Dissolved Organic Carbon		<1	2		
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE 11 B 4.7 (Continued)

WATER QUALITY ANALYSIS  
DRILLING WATERWell Number: SG-17

Sample Number	11	12	13	14	15
Sampling Depth	1164-1212	1200-1224	1224-1250	1250-127	1289-1309
Element Measured					
1. Aluminum (ug/l)					
2. Ammonia (mg/l)					
3. Arsenic (ug/l)					
4. Barium (ug/l)					
5. Beryllium (ug/l)					
6. Bicarbonate (mg/l)	960	945	805	710	700
7. Bismuth (ug/l)					
8. Boron (ug/l)	.03	0.4	1.0	0.2	1.8
9. Cadmium (ug/l)					
10. Calcium (mg/l)	5.7	9.0	22	9.0	7.4
11. Carbonate (mg/l)	78	60	56	72	<.1
12. Cerium (mg/l)					
13. Chloride (mg/l)	<4	<4	<4	<4	9.7
14. Chrome, Hexavalent					
15. Cobalt (ug/l)					
16. Conductivity, Specific (uS)					
17. Copper (ug/l)					
18. Fluoride (mg/l)	10	10	10	10	18
19. Gallium (ug/l)					
20. Hardness, Total					
21. Hydroxide (mg/l)					
22. Iron (ug/l)					
23. Lead (ug/l)					
24. Lithium (ug/l)					
25. Magnesium (mg/l)	5.8	4.3	3.6	2.8	5.3
26. Manganese (ug/l)					
27. Mercury (ug/l)					
28. Molybdenum (ug/l)					
29. Nickel (ug/l)					
30. Nitrate (mg/l)					
31. pH					
32. Phosphate, Total					
33. Potassium (mg/l)	<1	<1	<1	<1	<1
34. Selenium (ug/l)					
35. Silica (mg/l)	12	12	11	13	12
(*) 36. Silver (ug/l)					
37. Sodium (mg/l)	410	420	370	340	280
38. Solids, Dissolved (mg/l)	995	980	955	800	680
39. Strontium (ug/l)					
40. Sulfate (mg/l)	<4	<4	105	<4	<4
41. Titanium (ug/l)					
42. Vanadium (ug/l)					
43. Yttrium (mg/l)					
44. Zinc (ug/l)					
45. Zirconium (ug/l)					
46. Radioactivity					
Gross Alpha (pCi)					
Radium 226 <sup>**</sup>					
Gross Beta (pCi)					
Thorium 230 <sup>**</sup>					
Uranium <sup>**</sup>					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure					
Dissolved Organic Carbon					
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B 4.7 (Continued)  
WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-17

Sample Number	16	17	18	19	20
Sampling Depth	1329-1374	1374-1419	1423-1470	1475-1521	1514-1572
Element Measured					
1. Aluminum (ug/l)					
2. Ammonia (mg/l)					
3. Arsenic (ug/l)					
4. Barium (ug/l)					
5. Beryllium (ug/l)					
6. Bicarbonate (mg/l)	740	670	587	630	740
7. Bismuth (ug/l)					
8. Boron (ug/l)	0.1	1.0		.3	.2
9. Cadmium (ug/l)					
10. Calcium (mg/l)	8.2	5.7	4	4.1	4.1
11. Carbonate (mg/l)	36	<.1	8	<.1	<.1
12. Cerium (mg/l)					
13. Chloride (mg/l)	<4	6.9	4	7.0	13
14. Chrome, Hexavalent					
15. Cobalt (ug/l)					
16. Conductivity, Specific (uS)			800		
17. Copper (ug/l)					
18. Fluoride (mg/l)	10	19	17	20	20
19. Gallium (ug/l)					
20. Hardness, Total					
21. Hydroxide (mg/l)					
22. Iron (ug/l)					
23. Lead (ug/l)					
24. Lithium (ug/l)					
25. Magnesium (mg/l)	3.3	4.5	3	3.7	4.9
26. Manganese (ug/l)					
27. Mercury (ug/l)					
28. Molybdenum (ug/l)					
29. Nickel (ug/l)					
30. Nitrate (mg/l)					
31. pH			8.4		
32. Phosphate, Total					
33. Potassium (mg/l)	<1	<1	1	<1	<1
34. Selenium (ug/l)					
35. Silica (mg/l)	13	16	16	16	17
(*) 36. Silver (ug/l)					
37. Sodium (mg/l)	300	260	240	250	300
38. Solids, Dissolved (mg/l)	735	645	581	610	720
39. Strontium (ug/l)					
40. Sulfate (mg/l)	<4	<4	<4	<4	<4
41. Titanium (ug/l)					
42. Vanadium (ug/l)					
43. Yttrium (mg/l)					
44. Zinc (ug/l)					
45. Zirconium (ug/l)					
46. Radioactivity					
Gross Alpha (pCi)					
Radium 226*					
Gross Beta (pCi)					
Thorium 230**					
Uranium 238					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure:					
Dissolved Organic Carbon					
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).



TABLE II B 4.7 (Continued)

WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-17

Sample Number	21	22	23	24	25
Sampling Depth	1561-1622	1618-1670	1622	1668-1720	1711-1770
Element Measured					
1. Aluminum (ug/l)					
2. Ammonia (mg/l)					
3. Arsenic (ug/l)					
4. Barium (ug/l)					
5. Beryllium (ug/l)					
6. Bicarbonate (mg/l)	830	1110	700	1500	2170
7. Bismuth (ug/l)					
8. Boron (ug/l)	.5	1.4	.8	1.1	1.1
9. Cadmium (ug/l)					
10. Calcium (mg/l)	4.9	5.7	6.6	4.9	8.2
11. Carbonate (mg/l)	<.1	46	<.1	<.1	81
12. Cerium (mg/l)					
13. Chloride (mg/l)	14	18	2.8	20	34
14. Chrome, Hexavalent					
15. Cobalt (ug/l)					
16. Conductivity, Specific (u $\pi$ )					
17. Copper (ug/l)					
18. Fluoride (ug/l)	20	25	20	24	25
19. Gallium (ug/l)					
20. Hardness, Total					
21. Hydroxide (mg/l)					
22. Iron (ug/l)					
23. Lead (ug/l)					
24. Lithium (ug/l)					
25. Magnesium (mg/l)	8.0	4.3	2.8	6.8	3.3
26. Manganese (ug/l)					
27. Mercury (ug/l)					
28. Molybdenum (ug/l)					
29. Nickel (ug/l)					
30. Nitrate (mg/l)					
31. pH					
32. Phosphate, Total					
33. Potassium (mg/l)	<1	<1	<1	<1	<1
34. Selenium (ug/l)					
35. Silica (mg/l)	17	21	15	17	15
(*) 36. Silver (ug/l)					
37. Sodium (mg/l)	325	480	280	590	940
38. Solids, Dissolved (mg/l)	800	1150	670	1400	2175
39. Strontium (ug/l)					
40. Sulfate (mg/l)	<4	4	<4	<4	<4
41. Titanium (ug/l)					
42. Vanadium (ug/l)					
43. Yttrium (mg/l)					
44. Zinc (ug/l)					
45. Zirconium (ug/l)					
46. Radioactivity					
Gross Alpha (pci)					
Radium 226 <sup>**</sup>					
Gross Beta (pci)					
Thorium 230 <sup>**</sup>					
Uranium <sup>**</sup>					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure					
Dissolved Organic Carbon					
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).

TABLE II B 4.7 (Continued)

WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-17

Sample Number	26	27	28	29	30
Sample Line Depth	1768-1820'	1818-1870'	1869-1920'	1918-1970'	2120-2170'
Element Measured					
1. Aluminum (ug/l)					.9
2. Ammonia (mg/l)					137
3. Arsenic (ug/l)					.1
4. Barium (ug/l)					4.5
5. Beryllium (ug/l)					.003
6. Bicarbonate (mg/l)	2460	620	1200	1850	7,500
7. Bismuth (ug/l)					<.006
8. Boron (ug/l)	1.5	.9	1.8	.9	47
9. Cadmium (ug/l)					<.006
10. Calcium (mg/l)	7.4	4.9	10	16	<1
11. Carbonate (mg/l)	<.1	<.1	120	360	2930
12. Cerium (mg/l)					≤.04
13. Chloride (mg/l)	29	5.6	22	36	7740
14. Chrome, Hexavalent					<.01
15. Cobalt (ug/l)					.02
16. Conductivity, Specific (u $\chi$ )					58,000
17. Copper (ug/l)					.03
18. Fluoride (mg/l)	24	8.9	20	45	40
19. Gallium (ug/l)					≤.06
20. Hardness, Total			42	52	
21. Hydroxide (mg/l)					
22. Iron (ug/l)			<.05	.08	3.6
23. Lead (ug/l)					.81
24. Lithium (ug/l)					100
25. Magnesium (mg/l)	3.5	3.4	4.1	2.9	14
26. Manganese (ug/l)					.3
27. Mercury (ug/l)					.0001
28. Molybdenum (ug/l)					.04
29. Nickel (ug/l)					
30. Nitrate (mg/l)			<.1	<.1	1260
31. pH			8.4	8.9	8.3
32. Phosphate, Total			<.1	<.1	<.1
33. Potassium (mg/l)	<1	<1			
34. Selenium (ug/l)					<.006
35. Silica (mg/l)	14	15	12	16	22
(*) 36. Silver (ug/l)					<.006
37. Sodium (mg/l)	960	250	590	1100	14,000
38. Solids, Dissolved (mg/l)	2250	595	1480	2590	31,400
39. Strontium (ug/l)					3
40. Sulfate (mg/l)	<4	<4	98	82	<4
41. Titanium (ug/l)					.09
42. Vanadium (ug/l)					.3
43. Yttrium (mg/l)					<.006
44. Zinc (ug/l)					8
45. Zirconium (ug/l)					.6
46. Radioactivity					
Gross Alpha (pci)					0
Radium 226**					
Gross Beta (pci)					0
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l/l then measure					
Dissolved Organic Carbon					112
Suspended Organic Carbon					117
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).



TABLE II B 4.7 (Continued)  
WATER QUALITY ANALYSIS  
DRILLING WATER

Well Number: SG-17

Sample Number	31				
Sampling Depth	2608'				
Element Measured					
1. Aluminum (ug/l)					
2. Ammonia (mg/l)					
3. Arsenic (ug/l)					
4. Barium (ug/l)					
5. Beryllium (ug/l)					
6. Bicarbonate (mg/l)	1730				
7. Bismuth (ug/l)					
8. Boron (ug/l)	<.1				
9. Cadmium (ug/l)					
10. Calcium (mg/l)	7.4				
11. Carbonate (mg/l)	96				
12. Cerium (mg/l)					
13. Chloride (mg/l)	<4				
14. Chrome, Hexavalent					
15. Cobalt (ug/l)					
16. Conductivity, Specific (u $\sigma$ )					
17. Copper (ug/l)					
18. Fluoride (mg/l)	10				
19. Gallium (ug/l)					
20. Hardness, Total					
21. Hydroxide (mg/l)					
22. Iron (ug/l)					
23. Lead (ug/l)					
24. Lithium (ug/l)					
25. Magnesium (mg/l)	5.8				
26. Manganese (ug/l)					
27. Mercury (ug/l)					
28. Molybdenum (ug/l)					
29. Nickel (ug/l)					
30. Nitrate (mg/l)					
31. pH					
32. Phosphate, Total					
33. Potassium (mg/l)	<1				
34. Selenium (ug/l)					
35. Silica (mg/l)	15				
(*) 36. Silver (ug/l)					
37. Sodium (mg/l)	740				
38. Solids, Dissolved (mg/l)	1725				
39. Strontium (ug/l)					
40. Sulfate (mg/l)	<4				
41. Titanium (ug/l)					
42. Vanadium (ug/l)					
43. Yttrium (mg/l)					
44. Zinc (ug/l)					
45. Zirconium (ug/l)					
46. Radioactivity					
Gross Alpha (pci)					
Radon 226*					
Gross Beta (pci)					
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l/l then measure					
Dissolved Organic Carbon					
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).

THE OIL SHALE CORPORATION

INTER OFFICE MEMORANDUM

LABORATORY DATA LETTER 75-46

FROM: F. C. Haas

DATE: March 4, 1975

TO: File

FILE NO.: 5100-3

SUBJECT: Analyses of Water  
Samples from C-b Tract,  
Core Hole SG-1


Project No. 197

Seven water samples were taken while coring Core Hole SG-1. All samples were analyzed for major constituents and four had a comprehensive analysis done. Major constituent analyses were done by Industrial Laboratories, Denver, Colorado, and TOSCO, Rocky Flats. Minor constituent analyses were done by Industrial Laboratories. Trace metals and total organic carbon were done by Commercial Testing & Engineering Co., Golden, Colorado. Radioactivity was done by Hazen Research, Inc., Golden, Colorado. Results of the analyses are attached.

There are no major discrepancies in the major constituent analyses, except in the lower aquifer 1930 feet sample. TOSCOs' calcium and sulfate values are lower than Industrial Laboratories. This is probably due to the fact that samples were analyzed at different times. Calcium sulfate and/or bicarbonate tend to precipitate with time.

Total organic carbon in all the samples was less than 10 mg/l.

Gross alpha in three of the environmental samples was above 4 pCi/l; Ra<sub>226</sub> was determined and found to contain less than 4 pCi/l in all three samples.

  
FCH/aw  
Encs.

  
Approved (MTA)

cc: Messrs. Vawter, Schulman, Spence, Cleveland, Schillinger,  
Legatski (ARCO), Matis (ARCO) and Tait (ARCO)

Table 1

## MAJOR CONSTITUENT ANALYSES, SG-1

Component	613 ft		Base of "A" - 970 ft		Base Mahogany Zone 1105 ft		Top Mahogany Zone - 1366 ft		Lower Aquifer 1930 ft		2525 ft		Parachute Industrial
	Industrial	TOSCO	Industrial	TOSCO	Industrial	TOSCO	Industrial	TOSCO	Industrial	TOSCO	Industrial	TOSCO	
Sodium, mg/l	200	204	200	200	250	200	208	2970	3390	2970	550	610	
Potassium, mg/l	NA	0.4	NA	0.4	NA	0.3	0.4	22	NA	22	<1	<1	
Calcium, mg/l	16	12	13	9	12	9	13.6	7	44	7	20	16	
Magnesium, mg/l	22	21	17	15	15	15	20.4	36	28	36	13	11	
Sulfate, mg/l	120	103	83	56	92	56	84	292	400	292	150	205	
Carbonate, mg/l	<0.1	12	<0.1	5	<0.1	3	0	321	170	321	<0.1	<0.1	
Bicarbonate, mg/l	460	469	500	546	580	549	553	4587	6110	4587	1280	1330	
Chloride, mg/l	9.6	4	<1	4	6.9	5	6	1361	1330	1361	43	56	
Fluoride, mg/l	9.8	8.2	10.2	9.6	10	9.2	7.8	14	10	14	14	14	
Lithium, mg/l	<0.5	<0.5	<0.5	NA	<0.5	NA	NA	10	12	10	NA	NA	
Σ Cations, meq/l	11.31	11.20	10.74	10.35	12.70	10.34	11.41	134	154	134	25.98	28.23	
Σ Anions, meq/l	10.83	10.78	10.46	10.90	12.15	10.87	11.39	131	152	131	26.06	28.39	
% Difference	2.2	1.9	1.3	2.6	2.2	2.5	<0.1	1.1	0.7	1.1	0.2	0.3	
Silica, mg/l	15	14	13	11	15	15	14	14	15	14	13	13	
pH	8.0	8.5	7.9	8.3	7.9	8.3	8.2	9.2	8.5	9.2	NA	NA	
Calculated TDS, mg/l	618	608	584	577	685	582	625	7295	8393	7295	1430	1577	
Conductivity, μmhos/cm	980	980	980	990	980	1020	1050	11,000	10,800	11,000	NA	NA	

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74  
DATE REPORTED: 12/9/74

LAB. NUMBER: 5007

SAMPLE MARKED: SG #1 613

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	16	0.798
Magnesium	22	1.810
Sodium	200	8.700
Carbonate	Less than 0.1	---
Bicarbonate	460	7.539
Chloride	9.6	0.271
Sulfate	120	2.498
Nitrate	Less than 0.1	---
Phosphate	0.1	---
Silicon dioxide	15	0.533
Iron	Less than 0.05	---
Fluoride	9.8	0.515
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	Aluminum
Hardness, in terms of calcium carbonate	130	Less than 0.1
Total dissolved solids (calculated)	625	Copper
		Less than 0.1
		Cadmium
		Less than 0.01
		Lead
		Less than 0.05
		Manganese
		Less than 0.05
Ammonia-nitrogen	0.5	Silver
Lithium	Less than 0.5	Less than 0.05
Barium	Less than 1.0	Zinc
Hexavalent chromium	Less than 0.01	Less than 0.5
Arsenic	0.01	pH
		8.0
Selenium	Less than 0.01	Specific conductance
Boron	Less than 0.5	980 micromhos per cm
Hydroside	Less than 0.1	

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AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-62

THE INDUSTRIAL LABORATORIES COMPANY  
*H. Paul Vicks*

CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74  
DATE REPORTED: 12/9/74

LAB. NUMBER: 5011

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: SG #1 Above Base "A" 990 feet

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

13  
17  
200  
Less than 0.1  
500

0.649  
1.399  
8.700  
---  
8.195

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

Less than 1  
83  
0.9  
Less than 0.1  
13

---  
1.728  
---  
---  
0.432

Iron  
Fluoride  
P. alkalinity, in terms of  
calcium carbonate  
MO alkalinity, in terms of  
calcium carbonate  
Hardness, in terms of  
calcium carbonate  
Total dissolved solids  
(Calculated)

0.05  
10.2  
---  
---  
100  
585

---

### MILLIGRAMS PER LITER

Aluminum  
Copper  
Cadmium  
Lead  
Manganese

Less than 0.1  
Less than 0.1  
Less than 0.01  
Less than 0.05  
Less than 0.05

Ammonia-nitrogen  
Lithium  
Barium  
Hexavalent chromium  
Arsenic

0.4  
Less than 0.5  
Less than 1.0  
Less than 0.01  
Less than 0.01

Silver  
Zinc

Less than 0.05  
Less than 0.5

Selenium  
Boron  
Hydroxide

Less than 0.01  
2.8  
Less than 0.1

pH 7.9  
Specific conductance 980 micromhos per cc

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Deha*  
CHEMIST

II B-63

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INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5014

SAMPLE MARKED: SG #1 at 1105 feet Base Mine Zone

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium	12	0.599
Magnesium	15	1.249
Sodium	250	10.875
Carbonate	Less than 0.1	---
Bicarbonate	580	9.506

Chloride	6.9	---
Sulfate	92	2.595
Nitrate	0.5	---
Phosphate	Less than 0.1	---
Silicon dioxide	15	0.496

Iron	0.4	---
Fluoride	10	0.526

P. alkalinity, in terms of  
calcium carbonate

---

MO alkalinity, in terms of  
calcium carbonate

---

Hardness, in terms of  
calcium carbonate

92

Total dissolved solids  
(calculated)

685

### MILLIGRAMS PER LITER

Aluminum	Less than 0.1
Copper	Less than 0.1
Cadmium	Less than 0.01
Lead	Less than 0.05
Manganese	Less than 0.05

Ammonia-nitrogen	0.4
Lithium	Less than 0.5
Barium	Less than 1.0
Hexavalent chromium	Less than 0.01
Arsenic	Less than 0.01

Silver	Less than 0.05
Zinc	Less than 0.5

Selenium	Less than 0.01
Boron	2.3
Hydroxide	Less than 0.1

pH 7.9  
Specific conductance 980 micromhos per cc

MEMBERS OF:

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AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-64

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul O'Connell*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75  
LAB. NUMBER: 5940

SAMPLE MARKED: SG #1 - Lower 1930 Feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	44	2.196
Magnesium	28	2.304
Sodium (by flame)	3,390	147.465
Carbonate	170	5.061
Bicarbonate	6,110	100.204
Chloride	1,330	37.506
Sulfate	400	8.320
Nitrate	0.1	---
Phosphate	Less than 0.1	---
Silicon dioxide	15	0.499
Iron	0.12	---
Fluoride	10	0.536
P. alkalinity, in terms of calcium carbonate	---	
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	225	
Total dissolved solids (calculated)	8,380	
		MILLIGRAMS PER LITER
		Aluminum
		Copper
		Cadmium
		Lead
		Manganese
		Silver
		Zinc
		Mercury
Ammonia-nitrogen	36	Less than 0.05
Lithium	12	Less than 0.5
Barium	Less than 1.0	Less than 0.01
Hexavalent chromium	Less than 0.05	
Arsenic	0.02	
Selenium	Less than 0.01	
Boron	3.3	
Hydroxide	Less than 0.1	
		pH
		Specific conductance
		10,800 micromhos per cc

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

cc: Tosco

RECEIVED

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*  
CHEMIST

II B-65

JAN 16 1975

TOSCO/GOLDEN

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5943

SAMPLE MARKED: Water

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

ANALYSIS:	SG 1 12/6 2,525'	(BASE) SG 1 Para- chute 2179'	AT 1 12/23 9 AM	SG 17 1280-1309' 11/3
Calcium	20	16	16	7.4
Magnesium	13	11	9.5	5.3
Sodium	550	610	200	280
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	Less than 0.1	Less than 0.1
Bicarbonate	1,280	1,330	570	700
Chloride	43	56	7.0	9.7
Fluoride	14	14	13	18
Sulfate	150	205	Less than 4	Less than 4
Boron	2.0	1.9	18.1	1.8
Silicon dioxide	13	13	16	12

Figures are milligrams per liter

MEMBERS OF:

AMERICAN ASSN OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS ASSOCIATION  
ASSN OF OFFICIAL AGENCIES OF CHEMISTS  
FEDERAL BUREAU OF INVESTIGATION  
INSTITUTE OF FOOD TECHNOLOGY  
SIOGA 21

CC: Tosco

II B-66

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul V. V.*

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

Attn: John Matis

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/17/75

LAB. NUMBER: 5943

SAMPLE MARKED: Water

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

SG 1  
12/6  
2,525'

Calcium 0.988  
Magnesium 1.070  
Sodium 23.925  
Bicarbonate 20.992  
Chloride 1.213  
Sulfate 3.120  
Silicon dioxide 0.433

SG 17  
DST 18  
1,374'

Calcium 0.284  
Magnesium 0.370  
Sodium 11.310  
Bicarbonate 10.988  
Chloride ---  
Fluoride 0.999  
Sulfate ---  
Silicon dioxide 0.533

SG 1  
Para-  
chute

0.798  
0.905  
26.535  
21.812  
1.580  
4.264  
0.433

SG 17 12/12  
DST 28  
1,514-1,572'

0.205  
0.403  
13.050  
12.135  
0.367  
1.052  
---  
0.556

AT 1  
12/23  
9 AM

0.798  
0.782  
8.700  
9.348  
---  
---  
0.533

SG 17  
DST 21 12/20  
1,473-1,522'

0.205  
0.304  
10.875  
10.332  
---  
1.052  
---  
0.533

SG 17  
1280-1309'  
11/3

0.359  
0.435  
12.180  
11.480  
0.274  
---  
0.400

SG 17 12/14  
DST 24  
1,561-1,622'

0.245  
0.658  
14.138  
13.612  
0.395  
1.052  
---  
0.566

Figures are milli-equivalents

## MEMBERS OF:

AMERICAN ASSN. OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASSN. OF OFFICIAL BAKING CHEMISTS  
BAKERY PRODUCERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIOMA XI

II B-67

THE INDUSTRIAL LABORATORIES COMPANY

*J. P. ...*  
CHEMIST



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 00601 • AREA CODE 312 720-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401



Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: SG #1 @ 613'

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.004
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.1
Bismuth		Europium		Niobium		Scandium	0.002
Lead	$\leq 0.01$	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	.8	Chlorine	*
Gold		Cerium		Rubidium	0.005	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	0.09
Iridium		Barium	0.2	Selenium		Silicon	*
Osmium		Cesium		Arsenic	0.02	Aluminum	0.1
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.002	Sodium	*
Tantalum		Antimony		Zinc	0.01	Fluorine	*
Hafnium		Tin		Copper	0.08	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.04	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.001	Carbon	NR
Thulium		Silver		Iron	0.08	Boron	0.4
Erbium		Palladium		Manganese	0.01	Beryllium	
Holmium		Rhodium		Chromium	0.01	Lithium	0.4
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported  $< 0.002 \mu\text{g/ml}$

\* Not reported upon request

II B-68

Approved:

*M. J. Jacobs*

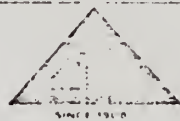


# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401



Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO SG #1 Abone Base "A" at 970'

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.001
Thorium		Gadolinium		Molybdenum	0.01	Titanium	0.03
Bismuth		Europium		Niobium		Scandium	<0.001
Lead	0.01	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium		Rubidium	0.01	Sulfur	*
Platinum		Lanthanum		Bromine	0.02	Phosphorus	1
Iridium		Barium	0.1	Selenium		Silicon	*
Osmium		Cesium	0.007	Arsenic	0.02	Aluminum	0.4
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.05	Fluorine	*
Hafnium		Tin		Copper	0.1	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.006	Carbon	NR
Thulium		Silver		Iron	0.1	Boron	0.1
Erbium		Palladium		Manganese	0.03	Beryllium	0.001
Holmium		Rhodium		Chromium	0.009	Lithium	4
Dysprosium						Hydrogen	NR

NR -- Not Reported

All elements not reported <0.003  $\mu\text{g/ml}$

\*Not reported upon request

II B-69

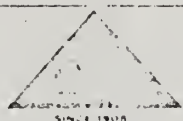
Approved:

*M. J. Sweeney*

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to



To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO et al SG #1 @ 1105'  
Base mine zone

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.03	Titanium	0.2
Bismuth		Europium		Niobium		Scandium	0.001
Lead	0.03	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium		Rubidium	0.008	Sulfur	*
Platinum		Lanthanum		Bromine	0.02	Phosphorus	0.2
Iridium		Barium	0.1	Selenium	**0.08	Silicon	*
Osmium		Cesium	0.004	Arsenic	**0.08	Aluminum	MC
Rhenium		Iodine	0.003	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.003	Sodium	*
Tantalum		Antimony		Zinc	0.04	Fluorine	*
Hafnium		Tin		Copper	0.06	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.01	Carbon	NR
Thulium		Silver		Iron	0.1	Boron	0.2
Erbium		Palladium		Manganese	0.04	Beryllium	0.001
Holmium		Rhodium		Chromium	0.02	Lithium	1
Dysprosium						Hydrogen	NR

NR - Not Reported

II B-70

All elements not reported  $< 0.003 \mu\text{g/ml}$

Approved:

MC - Major Component - element greater than  $10 \mu\text{g/ml}$

\*Not reported upon request

\*\*Heterogeneous

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas.  
The Oil Shale Corp.  
18200 West Hiway 72  
Golden, CO 80401

Date: 4 February 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO environmental sample SG-1 Lower  
Aquifer SG-1 Pkr set @ 1930'  
CONCENTRATION IN  $\mu\text{g/ml}$

IAD No.: 97-210-002-06

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.06
Thorium		Gadolinium		Molybdenum	0.06	Titanium	0.2
Bismuth		Europium		Niobium	0.01	Scandium	0.001
Lead	0.01	Samarium		Zirconium	0.1	Calcium	*
Thallium		Neodymium		Yttrium	0.002	Potassium	*
Mercury	NR	Praseodymium	0.004	Strontium	5	Chlorine	*
Gold		Cerium		Rubidium	0.03	Sulfur	*
Platinum		Lanthanum	0.008	Bromine	2	Phosphorus	0.2
Iridium		Barium	0.5	Selenium		Silicon	*
Osmium		Cesium	0.2	Arsenic	0.2	Aluminum	0.2
Rhenium		Iodine	2	Germanium	0.01	Magnesium	*
Tungsten		Tellurium		Gallium	0.01	Sodium	*
Tantalum		Antimony	0.01	Zinc	0.03	Fluorine	*
Hafnium		Tin		Copper	0.05	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.1	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.009	Carbon	NR
Thulium		Silver		Iron	0.3	Boron	>10
Erbium		Palladium		Manganese	0.07	Beryllium	0.001
Holmium		Rhodium		Chromium	0.004	Lithium	>10
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported  $<0.003 \mu\text{g/ml}$

\*Not reported upon request

II B-71

Approved:

*M. J. Jacobs*

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-0434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

9 January 75

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-183-002-12

## Analytical Report

	TOC* mg/liter
Environmental Cb-4 (11-17-74)	-1
Environmental Cb-2 (11-16-74)	-1
Environmental Cb-1 (11-18-74)	1
✓ ARCO SG #1 above Base "A" grove @ 970'	-1
✓ ARCO et al SG #1 @ 1105' Base mine Zone	-1
ARCO et al SG #17 #7 Dst. 1017'-1062'	-1
ARCO et al SG #8 Btm of mining zone @ 1013'	-1
Top of parachute cr @ 706	-1
ARCO et al SG #8 971-Top of mining zone (11-4-74)	-1
✓ SG #1 @ 613'	-1
ARCO SG #8 600' 1600 mΩ 10-26-74	-1
ARCO et al #17 Dst Depth 808' (11-9-74)	6

\*Test performed on water make "Regular".  
Minus sign indicates less than reported value.

M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-72





FEB 7 1975

TOSCO/GOLDEN

## COMMERCIAL TESTING &amp; ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

3 February 75


Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

Re: IAD #97-210-002-06

## Analytical Report

TOC\*  
mg/liter

- ✓ 1) ARCO environmental sample SG-1 Lower Aquifer  
SG-1 Pkr set @ 1930' 3
- 2) ARCO environmental upper aquifer - conductivity  
2500  $m\mu$  - Pkr set @ 950' - 12/17/74  
Temp. 25.5°C Jetting #2 SG-8 <1
- ! 3) ARCO environmental sample lower aquifer SG-8  
Pkr set @ 1910' conductivity 8000  $m\mu$   
Temp. 29.5°C 3

\*Test performed on water marked "Regular"  
Outside Laboratory  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-73





HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: January 2, 1975  
HRI Project No.  
HRI Series No.  
Samples received:  
Nov. 27, 1974

535  
7655

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$pCi/l$		$pCi/l$		$Ra^{226}$	$pCi/l$		Precision*
		Total	±	Precision*	Total	±	Precision*	Total	±		Precision*		
7655-1 ✓	Arco et al SG#10-1105	9.7	±	2.6	0	±	8	0.3	±	0.4	±	0.4	
-2	Base Mine Zone	4.3	±	5.5	0	±	25	0.1	±	0.4	±	0.4	
-3	Environmental Cb-1 11/18												
	Arco et al SG#8 Bottom of Mining zone @ 1013	3.4	±	2.6	0	±	11						
-4 ✓	Arco SG#1 Above Base "A" Grove @ 970	0	±	1.6	0	±	7						
-5	Environmental Cb-2 11/16	1.8	±	2.3	0	±	9						
-6	Top of Parachute @ 706	0.4	±	1.6	0	±	8						
-7	Arco et al SG#17, #7 DST 1015-1062	4.5	±	2.0	0	±	8	0.3	±	0.5	±	0.5	
-8 ✓	SG#1-613	11	±	3	0	±	8	0	±	0.4	±	0.4	
-9	Arco et al SG#17 DST Depth 808 11/9	1.3	±	1.5	0	±	8						
-10	Environmental Cb-4 11/17	1.0	±	1.5	0	±	8						
-11	Arco et al SG#8 Depth 971												
	Top of Mining Zone 11/4	0.8	±	2.5	0	±	11						
-12	Arco SG#8 600 ft. 1600 ml 10/26	2.6	±	2.0	0	±	8						

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

HAZARD RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: February 19, 1975  
HRI Project No. 535  
HRI Series No. 7791  
Samples received Jan. 6, 1975  
P.O. Number

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	pCi/l		pCi/l	
		$\alpha$	$\alpha$	$\beta$	$\beta$
		Total $\pm$ Precision**	Total $\pm$ Precision**	Total $\pm$ Precision**	Total $\pm$ Precision**
7791-1*	212-83	17 $\pm$ 3	0	0	$\pm$ 10
-2*	ARCO Environmental Sample Lower Aquifer SG-8	24 $\pm$ 15	0	0	$\pm$ 69
-3*	ARCO Environmental Sample Lower Aquifer SG-1	28 $\pm$ 17	0	0	$\pm$ 74
-4	ARCO Environmental Sample Upper Aquifer Setting 2, SG-8	2.1 $\pm$ 3.7	0	0	$\pm$ 16

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

ljb

\*Ra<sup>226</sup> Analysis in progress; results to follow at a later date.

\*\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

# HAZEN RESEARCH, INC.

## REPORT OF ANALYSIS

Supplement to report dated February 19, 1975

4601 INDIANA STREET  
GOLDEN, COLORADO • 80401  
TELEPHONE 303/279-4501

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: February 27, 1975

HRI Project No. 535  
HRI Series No. 7791  
Samples Rec'd 1/6/75

Analysis No.	Sample Designation	pCi/l	
		Ra <sup>226</sup>	± Precision*
7791-1	212-83	8.4	± 3.8
-2	ARCO Environmental Sample Lower Aquifer SG-8	2.7	± 2.2
-3 ✓	ARCO Environmental Sample Upper Aquifer SG-13 Lower	3.0	± 1.9

By:

*Richard P. Ober*  
John C. Jarvis  
Manager, Analytical Laboratory

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ

amb

II B-76

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MAR 3 1975  
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# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/6/74

LAB. NUMBER: 5012

SAMPLE MARKED: \* *What well? (SG-1)*  
Top of Parachute at 706 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	<u>MILLIGRAMS PER LITER</u>	<u>MILLI-EQUIVALENTS</u>	
Calcium	14	0.699	
Magnesium	20	1.646	
Sodium	210	9.135	
Carbonate	Less than 0.1	---	
Bicarbonate	520	8.523	
Chloride	5.5	---	
Sulfate	100	2.082	
Nitrate	0.2	---	
Phosphate	Less than 0.1	---	
Silicon dioxide	14	0.466	
Iron	Less than 0.05	---	
Fluoride	9.9	0.521	
P. alkalinity, in terms of calcium carbonate	---	<u>MILLIGRAMS PER LITER</u>	
MO alkalinity, in terms of calcium carbonate	---	Aluminum	Less than 0.1
Hardness, in terms of calcium carbonate	120	Copper	Less than 0.1
Total dissolved solids (calculated)	625	Cadmium	Less than 0.01
		Lead	Less than 0.05
		Manganese	Less than 0.05
Ammonia-nitrogen	0.5	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1		
Hexavalent chromium	Less than 0.01		
Arsenic	Less than 0.01		
Selenium	Less than 0.01	pH	8.0
Boron	2.7	Specific conductance	940 micromhos per cc
Hydroxide	Less than 0.1		

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ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

\* difficulty in  
picking top of P.Crk.

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul Ochs*  
CHEMIST

THE OIL SHALE CORPORATION

INTER OFFICE MEMORANDUM

LOS ANGELES ☐

DENVER ☐

GOLDEN ☒

NEW YORK ☐

LABORATORY DATA LETTER 75-48

FROM: F. C. Haas

DATE: March 4, 1975

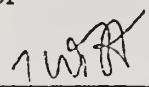
TO: File

FILE NO.:

SUBJECT: Analyses of Water  
Samples from C-b  
Tract, Core Hole SG-20

Five water samples were taken while coring SG-20. Samples were analyzed for major constituents only. Analyses were done by Industrial Laboratories, Denver, Colorado and TOSCO, Rocky Flats. Results are attached.

  
FCH/br

  
Approved (MTA)

cc: R. G. Vawter  
B. L. Schulman  
H. M. Spence  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski  
D. B. Tait  
J. R. Matis



TABLE 1

## MAJOR CONSTITUENT ANALYSES, SG-20

Component	Top of P.C.		850 ft		DST No. 1		*DST No. 2		Jetting TD (987')
	515 ft	Industrial	Industrial	Industrial	945 ft	TOSCO	981.5 ft	TOSCO	
Sodium, mg/l	190		530		780		670		680
Potassium, mg/l	<1		<1		0.9		1.2		<1
Calcium, mg/l	7.4		6.6		4.9		4.9		7.4
Magnesium, mg/l	3.5		5.2		3.0		3.1		6.2
Sulfate, mg/l	56		14		<4		<4		<4
Carbonate, mg/l	<0.1		<0.1		24		38		<0.1
Bicarbonate, mg/l	500		1,380		1,911		1,569		1,760
Chloride, mg/l	4.2		9.8		13		21		9.8
Fluoride, mg/l	3.6		19		23		20		24
Σ Cations, meg/l	8.92		23.80		34.42		29.65		30.45
Σ Anions, meg/l	9.67		24.19		33.67		28.66		30.39
% Difference	4.0		0.8		1.1		1.7		<0.1
Silica, mg/l	15		15		11		12		11
pH	NA		NA		8.4		8.6		NA
Calculated TDS, mg/l	525		1,276		1,796		1,540		1,600
Conductivity, micromhos/cm	NA		NA		2,200		2,100		NA

NA - Not Analyzed

\* Data cannot be placed stratigraphically

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5944  
Page 2

SAMPLE MARKED: Water

## ANALYSIS:

SG 17  
12/20

SG 20  
Jetting TD

SG 20  
Top of  
Parachute  
515'

SG 20  
12/6  
850'

Calcium	4.9	7.4	7.4	6.6
Magnesium	3.4	6.2	3.5	5.2
Sodium	250	680	190	530
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	Less than 0.1	Less than 0.1
Bicarbonate	620	1,760	500	1,380
Chloride	5.6	9.8	4.2	9.8
Fluoride	8.9	24	3.6	19
Sulfate	Less than 4	Less than 4	56	14
Boron	0.9	1.4	0.1	2.5
Silicon dioxide	15	11	15	15

Figures are milligrams per liter

cc: Tosco

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INSTITUTE OF FOOD TECHNOLOGY  
SIEMA XI

II B-80

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul R. R.*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/17/75

LAB. NUMBER: 5944

## SUPPLEMENTAL REPORT

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: Water

### ANALYSIS:

SG 17  
12/13  
1,622'

Calcium 0.329  
Magnesium 0.230  
Sodium 12.180  
Carbonate ---  
Bicarbonate 11.539  
Chloride ---  
Fluoride 1.052  
Silicon dioxide 0.500

SG 17  
DST 26  
12/12  
1,658-1,720'

0.245  
0.560  
25.665  
---  
24.519  
0.564  
1.202  
0.566

SG 17  
DST 27  
12/18  
1,711-1,770'

0.409  
0.272  
40.990  
2.697  
35.566  
0.959  
1.315  
0.500

SG 17  
DST 28  
1,768'

0.369  
0.272  
41.700  
---  
40.359  
0.813  
1.202  
0.466

SG 17  
12/20

Calcium 0.245  
Magnesium 0.280  
Sodium 10.875  
Bicarbonate 10.026  
Chloride ---  
Fluoride 0.999  
Sulfate ---  
Silicon dioxide 0.500

SG 20  
Jetting TD

0.369  
0.510  
29.580  
28.846  
0.276  
1.262  
---  
0.366

SG 20  
Top of  
Parachute  
515'

0.369  
0.283  
8.265  
8.177  
---  
---  
1.166  
0.500

SG 20  
12/6  
850'

0.329  
0.428  
23.055  
22.585  
0.276  
0.999  
0.291  
0.500

MADE OF:

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AMERICAN OIL CHEMISTS ASSOCIATION  
AMERICAN SOCIETY OF FOOD CHEMISTS  
BREAD BAKERS ASSOCIATION OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
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THE INDUSTRIAL LABORATORIES COMPANY

*J. P. [Signature]*  
CHEMIST

THE OIL SHALE CORPORATION  
INTER OFFICE MEMORANDUM

LOS ANGELES [ ]  
DENVER [ ]  
GOLDEN ☒  
NEW YORK [ ]

LABORATORY DATA LETTER 75-50

FROM: F. C. Haas

DATE:

March 4, 1975

TO: File

FILE NO.:

SUBJECT:

Analyses of Water  
Samples from C-b Tract,  
Core Hole SG-21

Five water samples were taken while coring SG-21. Samples were analyzed for major constituents only. Analyses were done by Industrial Laboratories, Denver, Colorado and TOSCO, Rocky Flats. Results are attached. The ionic balance on the sample from 980 feet is not too good.

*FCH*  
FCH/br

*work*  
Approved: (MTA)

cc: R. G. Vawter  
B. L. Schulman  
H. M. Spence  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski  
D. B. Tait  
J. R. Matis

TABLE 1

## MAJOR CONSTITUENT ANALYSES, SG-21

<u>Component</u>	<u>Top of P.C.</u> 676 ft	<u>DST No. 2</u> 950-1009 ft	<u>980 ft</u> <u>Industrial</u>	<u>DST No. 1</u> 1000-1035 ft	<u>J.T.</u> 1035 ft
	<u>TOSCO</u>	<u>Industrial</u>	<u>Industrial</u>	<u>Industrial</u>	<u>Industrial</u>
Sodium, mg/l	160	135	165	400	240
Potassium, mg/l	0.4	<1	<1	<1	NA
Calcium, mg/l	31	34	7.4	8.2	7.4
Magnesium, mg/l	26	33	3.8	7.2	3.3
Sulfate, mg/l	124	125	<1	455	18
Carbonate, mg/l	6	<0.1	12	<0.1	50
Bicarbonate, mg/l	422	470	530	500	360
Chloride, mg/l	3.2	7	5.6	1.4	82
Fluoride, mg/l'	1.4	4.9	16	16	16
$\Sigma$ Cations, meg/l	10.70	10.29	7.86	18.39	11.08
$\Sigma$ Anions, meg/l	9.85	10.76	10.08	18.56	11.09
% Difference	4.1	2.2	12.4	0.5	<0.1
Silica, mg/l	23	19	18	13	12
pH	8.4	NA	NA	NA	8.5
Calculated TDS, mg/l	581	588	488	1,146	605
Conductivity, micromhos/cm	750	NA	NA	NA	NA

NA - Not Analyzed



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75

DATE REPORTED: 1/15/75

LAB. NUMBER: 5945

SAMPLE MARKED: Water

## ANALYSIS:

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

DST 2 ✓  
SG 21  
950-1009'

SG 21 ✓  
12/18  
980'

SG 21 ✓  
DST #1  
12/19  
1000-1035'

SG 17  
DST 28  
12/15  
1618-1670'

Calcium	34	7.4	8.2	5.7
Magnesium	33	3.8	7.2	4.3
Sodium	135	165	400	480
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	12	Less than 0.1	46
Bicarbonate	470	530	500	1,110
Chloride	7.0	5.6	1.4	18
Fluoride	4.9	16	16	25
Sulfate	125	Less than 1	455	4.0
Boron	0.3	Less than 0.1	0.6	1.4
Silicon dioxide	19	18	13	21

Figures are milligrams per liter

cc: Tosco

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Welch*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Natis

DATE RECEIVED: 1/23/75

DATE REPORTED: 1/30/75

LAB. NUMBER: 6453

SAMPLE MARKED: SG #21 Jetting Test 1,035 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	7.4	0.369
Magnesium	3.3	0.272
Sodium	240	10.400
Carbonate	50	1.665
Bicarbonate	350	5.900
Chloride	82	2.313
Sulfate	18	0.375
Nitrate	Less than 0.1	---
Phosphate	Less than 0.1	---
Silicon dioxide	12	0.400
Iron	Less than 0.05	---
Fluoride	16	0.841
P. alkalinity, in terms of calcium carbonate	41	
MO alkalinity, in terms of calcium carbonate	300	
Hardness, in terms of calcium carbonate	32	
Total dissolved solids (calculated)	610	
Boron	0.6	
pH	8.5	

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*H. G. [Signature]*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 1/6/75  
DATE REPORTED: 3/17/75  
LAB. NUMBER: 5945

SAMPLE MARKED: Water - SG 21 12/18 980 Feet

## ANALYSIS:

Sodium	230 milligrams per liter
Sodium	10.00 milli-equivalents
Magnesium	0.313 " "

CORRECTED COPY  
SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ECT.) IN ADVANCE.

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SIGMA XI

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*

CHEMIST

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THE OIL SHALE CORPORATION  
INTER OFFICE MEMORANDUM

LOS ANGELES ☐  
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NEW YORK ☐

LABORATORY DATA LETTER 75-39

FROM: F. C. Haas

DATE: March 3, 1975

TO: File

FILE NO.: 5100-3

SUBJECT: Analyses of Water Samples  
from C-b Tract, Core Hole SG-17  
Project 197

Thirty-one water samples were taken in the course of drilling Core Hole SG-17. Four samples were marked "Environmental" and comprehensive analysis was done on these. Major constituent analyses were done on the balance of samples. Major constituent analyses were done by Industrial Laboratories, Denver, Colorado, and TOSCO, Rocky Flats. TOSCO analyzed sixteen of the thirty-one samples with results listed in Table 1. Minor constituents were done by Industrial Laboratories. Trace metals and total organic carbon was done by Commercial Testing & Engineering, Golden, Colorado. Radioactivity was done by Hazen Research, Inc., Golden, Colorado. Results of the analyses are attached.

There are no major discrepancies in the analyses except for the sample from DST #34, 2120-2170'. The sample is highly saline and this may account for some of the differences. The big discrepancy is in the boron analysis. Industrial Laboratories reports 156 mg/l (as  $\text{BO}_2$ ); CT&E reports 2,800 mg/l (as  $\text{BO}_2$ ); and TOSCO obtained 1,188 and 1,070 mg/l (as  $\text{BO}_2$ ) by two different methods, colorimetric and atomic absorption. CT&E used flame emission; high sodium can interfere using this technique. Industrial Laboratories used a colorimetric procedure different from TOSCO's.

In addition to  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$  and  $\text{NaCl}$ , the sample from DST #34 is high in nitrate (1,260 mg/l), ammonia-nitrogen (137 mg/l), borate (1,100 mg/l), barium (5 mg/l) lithium (60 mg/l), fluoride (50 mg/l), bromine (1 mg/l) and iodine (0.8 mg/l). The sample is high in total organic carbon (117 mg/l) and dissolved organic carbon (112 mg/l). An extraction for organic groups is being made and will be reported at a later date. The sample was low in radioactivity.

Memo from FCH to File  
March 3, 1975  
Page 2

In all of the other samples, total organic carbon was less than 10 mg/l. Three of the samples had gross alpha greater than 4p Ci/l; Ra226 was determined, but was found to be less than 4p Ci/l.

*JCH*  
FCH/as  
Encs.

*[Signature]*  
\_\_\_\_\_  
Approved (MTA)

cc: R. G. Vawter  
B. L. Schulman  
H. M. Spence  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski  
D. B. Tait  
J. R. Matis



TABLE 1  
MAJOR CONSTITUENT ANALYSES, CORE HOLE SG -17

Component	DST, 808'		Top of P.C. 859'		DST #3 822-869'		DST #4 866-919'		DST #5 919-970'		DST #6 970-1017'		DST #7 1015-1062'	
	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO
Na, mg/l	180	177	180	190	200	205	214	211	250	232	220	232	220	232
K, mg/l	N.A.	0.4	N.A.	0.4	N.A.	0.4	0.4	1.1	N.A.	0.9	N.A.	0.4	N.A.	0.4
Ca, mg/l	4.9	5.8	4.5	4.2	5.3	4.4	3.2	10	3.3	2.0	3.7	2.0	3.7	2.0
Mg, mg/l	0.7	1.4	2.1	2.0	1.9	2.0	2.7	6	2.6	2.2	2.1	2.1	2.1	2.1
SO <sub>4</sub> , mg/l	<4	<4	<4	4	<4	4	<4	4.6	<4	<4	<4	<4	<4	10
CO <sub>3</sub> , mg/l	<1	12	<0.1	12	<0.1	16	10	0	<0.1	4.8	<0.1	6	<0.1	6
HCO <sub>3</sub> , mg/l	430	403	440	428	490	462	495	533	620	594	580	561	580	561
Cl, mg/l	<1	3	6.9	3	6.9	1.4	2.3	4.1	4.1	1.6	4.1	1.9	4.1	1.9
F, mg/l	10	12.8	10	12.8	11	14.5	15.3	13.5	12	18	12	17	12	17
ΣCations, meq/l	8.13	8.11	8.22	8.64	9.12	9.31	9.64	10.20	11.25	10.39	9.92	10.37	9.92	10.37
ΣAnions, meq/l	7.58	7.77	7.93	8.27	8.81	9.04	9.31	10.52	10.91	10.89	10.26	10.56	10.26	10.56
% Difference	3.5	2.1	1.8	2.2	1.7	1.5	1.7	1.5	1.5	2.4	1.7	0.9	1.7	0.9
SiO <sub>2</sub> , mg/l	16	15	17	14	14	13	13	11	14	11	13	13	13	13
pH	7.9	8.9	8.2	9.0	7.9	9.1	8.6	8.2	8.1	8.3	8.1	8.4	8.1	8.4
Calculated TDS, mg/l	422	425	434	453	479	487	503	564	590	564	540	559	540	559
Conductivity, micromhos/cm	680	690	730	760	800	825	700	770	950	980	910	920	910	920

TABLE 1 (Cont'd)

Component	DST #8 1066-1116.7'		DST #9 1115-1166'		1180'		DST #11 1200-1224'		DST #13 1224-1250'		Depth 1250'		DST #17 1327-1374'		DST #19 1423-1470'	
	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO
Na, mg/l	315	267	303	303	245	270	420	445	370	389	340	346	300	298	240	240
K, mg/l	N.A.	0.4	0.5	0.5	<1	0.2	<1	0.7	<1	0.5	<1	0.4	<1	0.4	1	1
Ca, mg/l	4.9	2.0	2.2	2.2	8.2	2.5	9.0	3.6	22	10	9.0	3	8.2	4	4	4
Mg, mg/l	5.3	2.1	2.1	2.1	8.2	1.2	4.3	1.8	3.6	2.1	2.8	2	3.3	2	3	3
SO <sub>4</sub> , mg/l	<4	<4	5	5	<4	19	<4	19	105	103	<4	14	<4	16	<4	<4
CO <sub>3</sub> , mg/l	72	16	16	16	66	12	60	23	36	5	72	17	36	11	8	8
HCO <sub>3</sub> , mg/l	615	624	711	711	510	612	945	1036	805	891	710	797	740	705	587	587
Cl, mg/l	28	5.8	2.3	2.3	<4	1.4	<4	2	<4	1	<4	2	<4	2	4	4
F, mg/l	16	16	16	16	10	16.7	10	18	10	18	10	18	10	17	17	17
Σ Cations, meq/l	14.38	11.89	13.46	13.46	11.74	11.98	19.07	19.71	17.49	17.61	15.52	15.31	13.73	13.31	10.92	10.92
Σ Anions, meq/l	14.11	11.74	13.14	13.14	11.09	11.75	18.42	19.16	17.11	17.90	14.57	14.91	13.86	13.23	10.89	10.89
% Difference	0.9	0.6	1.2	1.2	2.8	1.0	1.7	1.4	1.1	0.8	3.2	1.3	0.5	0.3	0.1	0.1
SiO <sub>2</sub> , mg/l	13	9	9	9	14	12	12	11	11	8	13	11	13	12	16	16
pH	8.3	8.8	8.8	8.8	N.A.	8.8	N.A.	8.8	N.A.	8.4	N.A.	8.5	N.A.	8.5	8.4	8.4
Calculated TDS, mg/l	750	623	704	704	601	635	979	1032	952	974	795	803	733	708	581	581
Conductivity, micromhos/cm	920	910	1000	1000	N.A.	800	N.A.	1280	N.A.	1260	N.A.	1000	N.A.	960	800	800

TABLE 2

ANALYSES OF DST #34, 2120-2170'

<u>Component</u>	<u>Industrial</u>	<u>TOSCO</u>	<u>CT&amp;E</u>
Na, mg/l	14,000	15,140	N.A.
K, mg/l	N.A.	103	N.A.
Ca, mg/l	<1	11	N.A.
Mg, mg/l	14	5	N.A.
SO <sub>4</sub> , mg/l	<4	18	N.A.
CO <sub>3</sub> , mg/l	2,930	1,395	N.A.
HCO <sub>3</sub> , mg/l	17,300	22,295	N.A.
Cl, mg/l	7,740	7,670	N.A.
F, mg/l	40	48	28
Li, mg/l	100	58	61
BO <sub>2</sub> , mg/l	156	1,188*	2,800
Ba, mg/l	4.5	1,070**	
		N.A.	5
ΣCations, meq/l	624.1	670.1	
ΣAnions, meq/l	619.3	658.9	
% Difference	0.4	0.8	
SiO <sub>2</sub> , mg/l	22	24	
pH	8.3	8.6	
Calculated TDS, mg/l	33,484	36,585	
Conductivity, micromhos/cm	38,000	39,000	

\*Colorimetric

\*\*Atomic Absorption

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

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DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 12/13/74

DATE REPORTED: 12/26/74

LAB. NUMBER: 5440

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SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERSHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: Water from Tosco SG-17

## ANALYSIS:

	1,200-1,224'		1,224-1,250'	
	milligrams per liter	milli- equivalents	milligrams per liter	milli- equivalents
Calcium	9.0	0.449	22	1.098
Magnesium	4.3	0.354	3.6	0.296
Sodium	420	18.270	370	16.095
Potassium	Less than 1	---	Less than 1	---
Carbonate	60	1.998	36	1.199
Bicarbonate	945	15.498	805	13.202
Chloride	Less than 4	---	Less than 4	---
Fluoride	10	0.526	10	0.526
Sulfate	Less than 4	---	105	2.184
Boron	0.4	---	1.0	---
Silicon dioxide	12	0.400	11	0.366
TDS (Calc.)	979	ΣCations = 19.07 ΣAnions = 18.42 % Diff. = 1.7	TDS (Calc.) 952	ΣCations = 17.49 ΣAnions = 11.11 % Diff. = 1.1

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*M. J. Paul W. C. L.*

CHEMIST

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ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5010

SAMPLE MARKED: SG 17 DST 808 feet 11/9/74

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## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

4.9  
0.7  
180  
Less than 0.1  
430

0.245  
0.058  
7.830  
---  
7.048

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

Less than 1  
Less than 4  
1.9  
Less than 0.1  
16

---  
---  
---  
---  
0.532

Iron  
Fluoride  
P. alkalinity, in terms of  
calcium carbonate  
MO alkalinity, in terms of  
calcium carbonate  
Hardness, in terms of  
calcium carbonate  
Total dissolved solids  
(calculated)

0.63  
10  
---  
---  
18  
420

---  
0.529

### MILLIGRAMS PER LITER

Ammonia-nitrogen  
Lithium  
Barium  
Hexavalent chromium  
Arsenic

0.5  
Less than 0.5  
Less than 1.0  
Less than 0.01  
Less than 0.01

Selenium  
Boron  
Hydroxide

Less than 0.01  
2.3  
Less than 0.1

Aluminum 0.15  
Copper Less than 0.1  
Cadmium Less than 0.01  
Lead 0.22  
Manganese Less than 0.05

Silver Less than 0.05  
Zinc 1.4

pH 7.9  
Specific conductance 680 micromphos per c

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*J. Paul Ochs*  
CHEMIST



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DATE RECEIVED: 11/26/74  
DATE REPORTED: 12/9/74

LAB. NUMBER: 5013

SAMPLE MARKED: SG #17 11/10 Top of Parachute 859 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	4.5	0.225
Magnesium	2.1	0.173
Sodium	180	7.830
Carbonate	Less than 0.1	---
Bicarbonate	440	7.212
Chloride	6.9	---
Sulfate	Less than 4.0	---
Nitrate	0.4	---
Phosphate	Less than 0.1	---
Silicon dioxide	17	0.560
Iron	1.4	---
Fluoride	10	0.526
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	Aluminum 0.15
Hardness, in terms of calcium carbonate	20	Copper Less than 0.1
Total dissolved solids	440	Cadmium Less than 0.01
• (calculated)		Lead Less than 0.05
		Manganese Less than 0.05
Ammonia-nitrogen	0.5	Silver Less than 0.05
Lithium	Less than 0.5	Zinc Less than 0.5
Barium	Less than 1.0	
Hexavalent chromium	Less than 0.01	
Arsenic	Less than 0.01	pH 8.2
Selenium	Less than 0.01	Specific conductance 730 micromhos per cc
Boron	2.7	
Hydroxide	Less than 0.1	

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*John Paul DeLoe*  
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TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5008

SAMPLE MARKED: SG 17 DST #3 822-869 feet 11/74

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium	5.3	0.264
Magnesium	1.9	0.156
Sodium	200	8.700
Carbonate	Less than 0.1	---
Bicarbonate	490	8.031

Chloride	6.9	---
Sulfate	Less than 4	---
Nitrate	Less than 0.1	---
Phosphate	0.2	---
Silicon dioxide	14	0.466

Iron	1.5	---
Fluoride	11	0.579

P. alkalinity, in terms of calcium carbonate ---

MO alkalinity, in terms of calcium carbonate ---

Hardness, in terms of calcium carbonate 21

Total dissolved solids (calculated) 500

### MILLIGRAMS PER LITER

Aluminum	0.25
Copper	Less than 0.1
Cadmium	Less than 0.01
Lead	0.18
Manganese	Less than 0.05

Ammonia-nitrogen	0.7
Lithium	Less than 0.5
Barium	Less than 1.0
Hexavalent chromium	Less than 0.01
Arsenic	Less than 0.01

Silver	Less than 0.05
Zinc	Less than 0.5

Selenium	Less than 0.01
Boron	2.3
Hydroxide	Less than 0.1

pH 7.9  
Specific conductance 800 micromhos per cc

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CHEMIST

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ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5016

SAMPLE MARKED: SG #17 - #6DST 970-1017 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium 3.3  
Magnesium 2.6  
Sodium 250  
Carbonate Less than 0.1  
Bicarbonate 620

0.165  
0.214  
10.875  
---  
10.162

Chloride 4.1  
Sulfate Less than 4  
Nitrate Less than 0.1  
Phosphate Less than 0.1  
Silicon dioxide 14

0.433  
---  
---  
---  
0.631

Iron 0.54  
Fluoride 12  
P. alkalinity, in terms of  
calcium carbonate ---  
MO alkalinity, in terms of  
calcium carbonate ---  
Hardness, in terms of  
calcium carbonate 19  
Total dissolved solids  
(calculated) 600

### MILLIGRAMS PER LITER

Aluminum Less than 0.1  
Copper Less than 0.1  
Cadmium Less than 0.01  
Lead 0.08  
Manganese Less than 0.05  
Silver Less than 0.05  
Zinc 0.7

Ammonia-nitrogen 0.7  
Lithium Less than 0.5  
Barium Less than 1  
Hexavalent chromium Less than 0.01  
Arsenic Less than 0.01

pH 8.1

Specific conductance 950 micromhos per cc

Selenium Less than 0.01  
Boron 2.0  
Hydroxide Less than 0.1

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DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5009

SAMPLE MARKED: SG 17 #7 DST 1015-1062 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS	
Calcium	3.7	0.185	
Magnesium	2.1	0.173	
Sodium	220	9.570	
Carbonate	Less than 0.1	---	
Bicarbonate	580	9.506	
Chloride	4.1	---	
Sulfate	Less than 4.0	---	
Nitrate	1.9	---	
Phosphate	Less than 0.1	---	
Silicon dioxide	13	0.433	
Iron	0.38	---	
Fluoride	12	0.635	
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	18		
Total dissolved solids (calculated)	540		
Ammonia-nitrogen	0.9		
Lithium	Less than 0.5		
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.01		
Arsenic	Less than 0.01		
Selenium	Less than 0.01		
Boron	1.2		
Hydroxide	Less than 0.1		
		MILLIGRAMS PER LITER	
		Aluminum	Less than 0.1
		Copper	Less than 0.1
		Cadmium	Less than 0.01
		Lead	0.76
		Manganese	Less than 0.05
		Silver	Less than 0.05
		Zinc	Less than 0.5
		pH	8.1
		Specific conductance	910 micromhos per cc

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*H. Paul Olsen*  
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115 REPORT



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ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 12/6/74  
DATE REPORTED: 12/20/74

LAB. NUMBER: 5249

SAMPLE MARKED: SG #17 - DST #8 1,066 feet-1,116.7 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	4.9	0.244
Magnesium	5.3	0.272
Sodium	315	13.703
Carbonate	72	2.398
Bicarbonate	615	10.086
Chloride	28	0.790
Sulfate	Less than 4.	---
Nitrate	0.1	---
Phosphate	0.1	---
Silicon dioxide	13	0.433
Iron	0.38	---
Fluoride	16	0.842
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	---	Hydroxide Less than 0.1
Total dissolved solids (calculated)	26	Copper Less than 0.1
	750	Cadmium Less than 0.1
		Lead Less than 0.05
		Manganese Less than 0.05
Ammonia-nitrogen	0.2	Silver Less than 0.05
Lithium	Less than 0.5	Zinc Less than 0.5
Barium	Less than 1.0	Mercury Less than 0.01
Hexavalent chromium	Less than 0.01	
Arsenic	Less than 0.01	
Selenium	Less than 0.01	pH 8.3
Boron	1.4	Specific conductance
Aluminum	Less than 0.1	920 micromhos per cc

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*[Signature]*  
CHEMIST



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TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

DATE RECEIVED: 12/13/74

DATE REPORTED: 12/26/74

LAB. NUMBER: 5440

Attn: John Matis

SAMPLE MARKED: Water from Tosco SG-17

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERSHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

ANALYSIS:	1,180'		1,164-1,212'	
	milligrams per liter	milli-equivalents	milligrams per liter	milli-equivalents
Calcium	8.2	0.409	5.7	0.289
Magnesium	8.2	0.675	5.8	0.477
Sodium	245	10.658	410	17.835
Potassium	Less than 1	---	Less than 1	---
Carbonate	66	2.198	78	2.569
Bicarbonate	510	8.364	960	15.744
Chloride	Less than 4	---	Less than 4	---
Fluoride	10	0.526	10	0.526
Sulfate	Less than 4	---	Less than 4	---
Boron	Less than 0.1	---	0.3	---
Silicon dioxide	14	0.466	12	0.400
TDS (Calc.)	601	ΣCations = 11.74 ΣAnions = 11.09 % Diff. = 2.8	TDS (Calc.) 992	ΣCations = 18.60 ΣAnions = 18.84 % Diff. = 0.6

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DATE RECEIVED: 12/13/74

DATE REPORTED: 12/26/74

LAB. NUMBER: 5440  
page 3

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. DISCARDABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: Water from Tosco SG-17

## ANALYSIS:

	1,250'		1,327-1,374'		2,608'	
	milligrams per liter	milli- equivalents	milligrams per liter	milli- equivalents	milligrams per liter	milli- equivalents
Calcium	9.0	0.499	8.2	0.409	7.4	0.369
Magnesium	2.8	0.230	3.3	0.272	3.8	0.313
Sodium	340	14.790	300	13.050	740	32.190
Potassium	Less than 1	---	Less than 1	---	Less than 1	---
Carbonate	72	2.398	36	1.199	96	3.197
Bicarbonate	710	11.644	740	12.136	1,730	28.372
Chloride	Less than 4	---	Less than 4	---	Less than 4	---
Fluoride	10	0.526	10	0.526	10	0.526
Sulfate	Less than 4	---	Less than 4	---	Less than 4	---
Boron	0.2	---	0.1	---	Less than 0.1	---
Silicon dioxide	13	0.433	13	0.433	15	0.500
TDS (Calc.)	795		733		1,720	
ΣCations		15.52		13.73		32.87
ΣAnions		14.57		13.86		32.10
% Diff.		3.2		0.5		1.2

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BY: *John D. Baker*

CHEMIST

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ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/8/75  
DATE REPORTED: 1/10/75

LAB. NUMBER: 5943  
Page 2

SAMPLE MARKED: Water

## ANALYSIS:

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. DISCARDABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

	SG 17 DST 18 <u>1,374'</u>	SG 17 12/12 DST 28 <u>1,514-1,572'</u>	SG 17 DST 21 12/10 <u>1,473-1,522'</u>	SG 17 12/14 DST 24 <u>1,551-1,622'</u>
Calcium	5.7	4.1	4.1	4.9
Magnesium	4.5	4.9	3.7	8.0
Sodium	260	300	250	325
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	Less than 0.1	Less than 0.1
Bicarbonate	670	740	630	830
Chloride	6.9	13	7.0	14
Fluoride	19	20	20	20
Sulfate	Less than 4	Less than 4	Less than 4	Less than 4
Boron	1.0	0.2	0.3	0.5
Silicon dioxide	16	17	16	17
TDS (Calc.)	641	722	610	796

Figures are milligrams per liter

MEMBERS OF:

cc: Tosco

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*J. Paul Ochs*

CHEMIST

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# THE INDUSTRIAL LABORATORIES COMPANY

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ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75

DATE REPORTED: 1/15/75

LAB. NUMBER: 5944

SAMPLE MARKED: Water

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## ANALYSIS:

	SG 17 12/13 1,622'	SG 17 DST 26 12/12 1,668-1,720'	SG 17 DST 27 12/18 1,711-1,770'	SG 17 DST 28 1,768'
Calcium	6.6	4.9	8.2	7.4
Magnesium	2.8	6.8	3.3	3.3
Sodium	280	590	940	960
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	81	Less than 0.1
Bicarbonate	700	1,500	2,170	2,460
Chloride	2.8	20	34	29
Fluoride	20	24	25	24
Sulfate	Less than 4	Less than 4	Less than 4	Less than 4
Boron	0.8	1.1	1.1	1.5
Silicon dioxide	15	17	15	14
TDS (Calc.)	671	1,399	2,171	2,245

Figures are milligrams per liter

MEMORANDUM OF: cc: Tosco

AMERICAN ASSOCIATION OF GENERAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS SOCIETY  
ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS  
NATIONAL BUREAU OF STANDARDS  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-102

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul V. C.*

CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5944  
Page 2

SAMPLE MARKED: Water

## ANALYSIS:

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

	SG 17 12/20	SG 20 Jetting TD	SG 20 Top of Parachute 515'	SG 20 12/6 850'
Calcium	4.9	7.4	7.4	6.6
Magnesium	3.4	6.2	3.5	5.2
Sodium	250	680	190	530
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	Less than 0.1	Less than 0.1
Bicarbonate	620	1,760	500	1,380
Chloride	5.6	9.8	4.2	9.8
Fluoride	8.9	24	3.6	19
Sulfate	Less than 4	Less than 4	56	14
Boron	0.9	1.4	0.1	2.5
Silicon dioxide	15	11	15	15
TDS (Calc.)	593			

Figures are milligrams per liter

cc: Tosco

MEMBERS OF:

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AMERICAN CHEMICAL SOCIETY  
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ASTM OF CLINICAL TESTING CHEMISTS  
FEDERAL BUREAU OF INVESTIGATION  
INSTITUTE OF FOOD TECHNOLOGY  
SIEMA XI

II B-103

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul Nelson*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75  
LAB. NUMBER: 5943

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: Water

ANALYSIS:	SG 1 12/6 2,525'	SG 1 Para- chute	AT 1 12/23 9 AM	SG 17 1280-1309' 11/3
Calcium	20	16	16	7.4
Magnesium	13	11	9.5	5.3
Sodium	550	610	200	280
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	Less than 0.1	Less than 0.1
Bicarbonate	1,280	1,330	570	700
Chloride	43	56	7.0	9.7
Fluoride	14	14	13	18
Sulfate	150	205	Less than 4	Less than 4
Boron	2.0	1.9	18.1	1.8
Silicon dioxide	13	13	16	12
TDS (Calc.)				677

Figures are milligrams per liter

MEMBERS OF:

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CC: TOSCO

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Vella*

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

Attn: John Matis

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/17/75  
LAB. NUMBER: 5943

SAMPLE MARKED: Water.

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

SG 1  
12/6  
2,525'

SG 1  
Para-  
chute

AT 1  
12/23  
9 AM

SG 17 ✓  
1280-1309'  
11/3

Calcium 0.988  
Magnesium 1.070  
Sodium 23.925  
Bicarbonate 20.992  
Chloride 1.213  
Sulfate 3.120  
Silicon dioxide 0.433

0.798  
0.905  
26.535  
21.812  
1.580  
4.264  
0.433

0.798  
0.782  
8.700  
9.348  
---  
---  
0.533

0.369  
0.436  
12.180  
11.480  
0.274  
---  
0.400

SG 17 ✓  
DST 18  
1,374'

SG 17 12/12 ✓  
DST 28  
1,514-1,572'

SG 17 ✓  
DST 21 12/20  
1,473-1,522'

SG 17 12/14 ✓  
DST 24  
1,561-1,622'

Calcium 0.284  
Magnesium 0.370  
Sodium 11.310  
Bicarbonate 10.988  
Chloride ---  
Fluoride 0.999  
Sulfate ---  
Silicon dioxide 0.533

0.205  
0.403  
13.050  
12.136  
0.357  
1.052  
---  
0.556

0.205  
0.394  
10.875  
10.332  
---  
1.052  
---  
0.533

0.245  
0.658  
14.138  
13.612  
0.395  
1.052  
---  
0.566

Figures are milli-equivalents

MEMBERS OF:

AMERICAN ASSN. OF CHEMICAL ENGINEERS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS ASSOCIATION  
ASSN. OF PROFESSIONAL ENGINEERS  
CANADIAN INSTITUTE OF CHEMISTS  
INSTITUTE OF FOOD TECHNOLOGISTS  
SIOMA XI

II B-105

THE INDUSTRIAL LABORATORIES COMPANY

*[Signature]*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/17/75

LAB. NUMBER: 5944

## SUPPLEMENTAL REPORT

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERSISTENTLY ABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: Water

### ANALYSIS:

SG 17 ✓  
12/13  
1,622'

Calcium 0.329  
Magnesium 0.230  
Sodium 12.180  
Carbonate ---  
Bicarbonate 11.539  
Chloride ---  
Fluoride 1.052  
Silicon dioxide 0.500

SG 17 ✓  
DST 26  
12/12  
1,553-1,720'

0.245  
0.560  
25.665  
---  
24.519  
0.564  
1.262  
0.566

SG 17 ✓  
DST 27  
12/18  
1,711-1,770'

0.409  
0.272  
40.990  
2.697  
35.566  
0.959  
1.315  
0.500

SG 17 ✓  
DST 28  
1,763'

0.369  
0.272  
41.730  
---  
40.369  
0.813  
1.202  
0.466

SG 17 ✓  
12/20

Calcium 0.245  
Magnesium 0.280  
Sodium 10.875  
Bicarbonate 10.096  
Chloride ---  
Fluoride 0.999  
Sulfate ---  
Silicon dioxide 0.500

SG 20  
Jetting TD

0.369  
0.510  
29.520  
28.845  
0.276  
1.262  
---  
0.366

SG 20  
Top of  
Parachute  
515'

0.369  
0.283  
8.285  
8.177  
---  
1.166  
0.500

SG 20  
12/6  
850'

0.329  
0.428  
23.055  
22.585  
0.276  
0.999  
0.291  
0.500

MEMBERS OF:

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AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS SOCIETY  
ASSN. OF CEREAL PACKING CHEMISTS  
BAKERY INDUSTRIES OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

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THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul O'Connell*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/17/75

LAB. NUMBER: 5945

SAMPLE MARKED: Water

## ANALYSIS:

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

	DST 2 SG 21 950-1009'	SG 21 12/18 980'	SG 21 DST #1 12/19 1003-1035'	SG 17 DST 28 12/15 1616-1670' ✓
Calcium	1.697	0.409	0.369	0.284
Magnesium	2.715	3.127	0.592	0.354
Sodium	6.075	7.178	17.400	20.880
Carbonate	---	0.400	---	1.532
Bicarbonate	7.687	8.654	8.200	18.258
Chloride	0.197	0.158	---	0.508
Fluoride	---	0.798	0.842	1.315
Sulfate	2.603	---	9.473	0.083
Silicon dioxide	0.634	0.599	0.435	0.699

Figures are milli-equivalents

cc: Tosco

NUMBERS OF:

II B-107

THE INDUSTRIAL LABORATORIES COMPANY

AMERICAN ASSN. OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS SOCIETY  
ASSN. OF CEREAL MILLING CHEMISTS  
FARMER ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

*Paul J. Baker*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 1/23/75

DATE REPORTED: 1/30/75

LAB. NUMBER: 6451

SAMPLE MARKED: SG 17-DST 30 12/28

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. DISCARDABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	10	0.499
Magnesium	4.1	0.377
Sodium	590	25.665
Carbonate	120	3.996
Bicarbonate	1,200	19.668
Chloride	22	0.621
Sulfate	98	2.040
Nitrate	Less than 0.1	---
Phosphate	Less than 0.1	---
Silicon dioxide	12	0.400
Iron	Less than 0.05	---
Fluoride	20	1.052
P. alkalinity, in terms of calcium carbonate	98	
MO alkalinity, in terms of calcium carbonate	980	
Hardness, in terms of calcium carbonate	42	
Total dissolved solids (calculated)	1,480	
Boron	1.8	
pH	8.4	

## MEMBERS OF:

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AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Vicks*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 1/23/75

DATE REPORTED: 1/30/75

LAB. NUMBER: 6452

SAMPLE MARKED: SG17 - DST 31 12/30 1,918-1,970 Feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERSISTABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	16	0.798
Magnesium	2.9	0.239
Sodium	1,100	47.850
Carbonate	360	11.988
Bicarbonate	1,850	30.322
Chloride	36	1.016
Sulfate	82	2.527
Nitrate	Less than 0.1	---
Phosphate	Less than 0.1	---
Silicon dioxide	16	0.533
Iron	0.08	---
Fluoride	45	2.367
P. alkalinity, in terms of calcium carbonate	295	
MO alkalinity, in terms of calcium carbonate	1,520	
Hardness, in terms of calcium carbonate	52	
Total dissolved solids (calculated)	2,590	
Boron	0.9	
pH	8.9	

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AMERICAN OIL CHEMISTS' SOCIETY  
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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul*

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211

TELEPHONE 455-3641

## ANALYSIS REPORT

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 1/23/75

DATE REPORTED: 2/11/75

LAB. NUMBER: 6454

### CORRECTED COPIES

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERSHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ECT.) IN ADVANCE.

SAMPLE MARKED: SG 17 - DST 34 1/4/74 (?) 2120-2170'

### ANALYSIS:

milligrams per liter

Fluoride	40
Boron	47
Lithium	100
Barium	4.5

cc: Frank Haas

### MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL TADING CHEMISTS  
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INSTITUTE OF FOOD TECHNOLOGY  
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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*

CHEMIST

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# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

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ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED:  
DATE REPORTED: 2/11/75  
LAB. NUMBER:

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PENDING SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ECT.) IN ADVANCE.

SAMPLE MARKED:

## ANALYSIS:

NOTE: The Dianthrime method for boron is the U.S.G.S.

"Techniques of Water Resources Investigations" supplied by the U.S.G.S, Salt Lake City office.

Enclosed are the corrected results for lab #6454. A retest of lab #6452 for fluoride was 48 milligrams per liter.

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*W. Paul DeLoe*  
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FEB 18 1975

TOSCO/GOLDEN

II B-111

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
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ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 1/23/75

DATE REPORTED: 1/29/75

LAB. NUMBER: 6454

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: SG 17 - DST 34 1/4/74(?) 2,120-2,170 feet

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	Less than 1	---
Magnesium	14	1.152
Sodium	14,000	609.000
Carbonate	2,930	97.569
Bicarbonate	17,300	282.891
Chloride	7,740	218.345
Sulfate	Less than 4	---
Nitrate	1,260	20.304
Phosphate	Less than 0.1	---
Silicon dioxide	22	0.732
Iron	3.6	---
Fluoride	3.2	---
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	56	
Total dissolved solids (calculated)	34,400	
		Cadmium 0.06
		Copper 0.03
		Manganese 0.04
		Silver Less than 0.01
		Zinc 0.1
Boron	3.8	Lead 0.81
Lithium	Less than 1	Ammonia-nitrogen 137
Barium	Less than 1	
Hexavalent chromium	Less than 0.01	pH 8.3
Arsenic	Less than 0.01	
Selenium	Less than 0.01	Specific conductance
Aluminum	1.4	38,000 micromhos per cc
Hydroxide	Less than 1	

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AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
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BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-112

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul Dole*  
CHEMIST



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to



To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO et al #17 Dst. Dept. 808  
11/9/74

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.03	Titanium	0.1
Bismuth		Europium		Niobium		Scandium	0.002
Lead	0.2	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	0.3	Chlorine	*
Gold		Cerium		Rubidium	0.009	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	2
Iridium		Barium	0.03	Selenium	0.2	Silicon	*
Osmium		Cesium		Arsenic	0.008	Aluminum	1
Rhenium		Iodine	0.006	Germanium	0.007	Magnesium	*
Tungsten		Tellurium		Gallium	0.003	Sodium	*
Tantalum		Antimony		Zinc	0.4	Fluorine	*
Hafnium		Tin		Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.03	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.004	Carbon	NR
Thulium		Silver		Iron	0.5	Boron	0.04
Erbium		Palladium		Manganese	0.2	Beryllium	0.003
Holmium		Rhodium		Chromium	0.01	Lithium	0.8
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported  $<0.003 \mu\text{g/ml}$

\* Not reported upon request

II B-113

Approved:

*M. Jacobs*



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO et al SG #17 #7 Dst 1017'-1062'

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	<0.001
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.07
Bismuth		Europium		Niobium		Scandium	<0.001
Lead	0.02	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	21 ***	Praseodymium		Strontium	0.09	Chlorine	*
Gold		Cerium		Rubidium	0.002	Sulfur	*
Platinum		Lanthanum		Bromine	0.006	Phosphorus	0.09
Iridium		Barium	0.02	Selenium	0.1	Silicon	*
Osmium		Cesium		Arsenic	0.1	Aluminum	7
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.002	Sodium	*
Tantalum		Antimony		Zinc	0.2	Fluorine	*
Hafnium		Tin		Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.002	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.001	Carbon	NR
Thulium		Silver		Iron	0.3	Boron	0.07
Erbium		Palladium		Manganese	0.1**	Beryllium	
Holmium		Rhodium		Chromium	0.003	Lithium	0.3
Dysprosium						Hydrogen	NR

NR — Not Reported

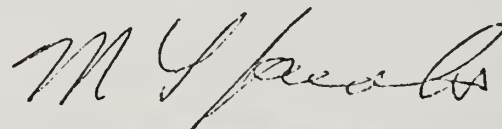
All elements not reported <0.002  $\mu\text{g/ml}$

\*Not reported upon request

\*\*Heterogeneous \*\*\* Flameless Atomic Absorption

II B-114

Approved:



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Date: 12 February 75

Analyst: S. Sweeney

P. O. No.: CORRECTED COPY

Sample No.: ARCO etal Sg #17 Dst #8 1066-1116.7

IAD No.: 97-190-002-03

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	<0.001
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.3
Bismuth		Europium		Niobium		Scandium	0.002
Lead	0.3	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	0.4	Chlorine	*
Gold		Cerium		Rubidium	0.01	Sulfur	*
Platinum		Lanthanum		Bromine	0.02	Phosphorus	0.3
Iridium		Barium	0.03	Selenium	0.03	Silicon	*
Osmium		Cesium	0.001	Arsenic	0.02	Aluminum	0.7
Rhenium		Iodine	0.002	Germanium	0.002	Magnesium	*
Tungsten	0.008	Tellurium	0.01	Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.2	Fluorine	*
Hafnium		Tin		Copper	0.08	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.008	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.008	Carbon	NR
Thulium		Silver		Iron	0.5	Boron	0.2
Erbium		Palladium		Manganese	0.06	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.006	Lithium	0.01**
Dysprosium						Hydrogen	NR

\* Not reported upon request  
\*\* Atomic Absorption

NR -- Not Reported

All elements not reported <0.002  $\mu\text{g/ml}$

II B-115

Approved:

*[Signature]*

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401  
(1) Flameless Atomic Absorption  
(2) Specific Ion Electrode  
(3) Atomic Absorption ~~Emission~~

Date: 25 February 75

Analyst: S. Sweeney

Sample No.: SG #17 Environmental Sample  
Dst. #34 2120'-  
2170' 1-4-74 CONCENTRATION IN  $\mu\text{g/ml}$

IAD No.: 97-229-002-05

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.3
Thorium		Gadolinium		Molybdenum	0.04	Titanium	0.09
Bismuth		Europium		Niobium		Scandium	0.06
Lead	0.6	Samarium		Zirconium	0.6	Calcium	**
Thallium		Neodymium		Yttrium		Potassium	**
Mercury	(1) 0.0001	Praseodymium		Strontium	3	Chlorine	(2) 1050
Gold		Cerium	$\leq 0.04$	Rubidium	0.4	Sulfur	**
Platinum		Lanthanum	$\leq 0.04$	Bromine	1	Phosphorus	1
Iridium		Barium	5	Selenium		Silicon	**
Osmium		Cesium	$\leq 0.04$	Arsenic	0.1	Aluminum	0.9
Rhenium		Iodine	0.8	Germanium	0.1	Magnesium	**
Tungsten		Tellurium		Gallium	$\leq 0.06$	Sodium	**
Tantalum		Antimony	0.02	Zinc	8	Fluorine	(2) 28
Hafnium		Tin		Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	*	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.02	Carbon	NR
Thulium		Silver		Iron	7	Boron	(3) 740
Erbium		Palladium		Manganese	0.3	Beryllium	0.003
Holmium		Rhodium		Chromium	0.2	Lithium	(3) 61
Dysprosium		* Molecular Interference				Hydrogen	NR

\*\* Not reported upon request

NR — Not Reported

All elements not reported  $< 0.006 \mu\text{g/ml}$

II B-116

Approved:

*M. Jacobas*

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 220 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-8434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

9 January 75

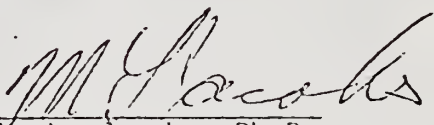
Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-183-002-12

Analytical Report

	TOC* mg/liter
Environmental Cb-4 (11-17-74)	-1
Environmental Cb-2 (11-16-74)	-1
Environmental Cb-1 (11-18-74)	1
ARCO SG #1 above Base "A" grove @ 970'	-1
ARCO et al SG #1 @ 1105' Base mine Zone	-1
✓ ARCO et al SG #17 #7 Dst. 1017'-1062'	-1
ARCO et al SG #8 Btm of mining zone @ 1013'	-1
Top of parachute cr @ 706	-1
ARCO et al SG #8 971-Top of mining zone (11-4-74)	-1
SG #1 @ 613'	-1
ARCO SG #8 600' 1600 m 10-26-74	-1
✓ ARCO et al #17 Dst Depth 808' (11-9-74)	6

\*Test performed on water make "Regular".  
Minus sign indicates less than reported value.

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-117





## COMMERCIAL TESTING &amp; ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-0434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

10 January 75

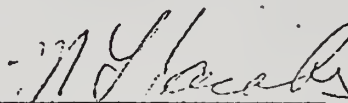
Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

RE: 1AD #97-190-002-03

Analytical Report

	TOC* mg/Liter
Environmental Sg #9 - String #1	<1
Environmental Sg #9 - String #2	8
✓ ARCO etal Sg #17 - Dst #8 1066-1116.7	2

\*Test performed on water marked "Regular"  
Outside laboratory

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-118





# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

25 February 75

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

## Analytical Report

SG #17 Environmental Sample  
Dst. #34 2120'-2170' 1-4-74

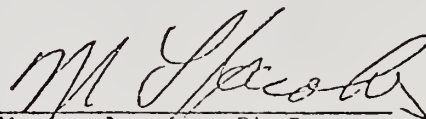
TOC\*  
mg/liter  
117

SG #17 Environmental Sample  
Dst. #34 2120'-2170' 1-4-74

DOC\*  
mg/liter

112

\* Test performed on sample marked "Regular"  
Outside laboratory

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/dh

II B-119



RECEIVED  
JAN 3 1975  
TOSCO/GOLDEN

HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: January 2, 1975  
HRI Project No. 535  
HRI Series No. 7655  
Samples received: Nov. 27, 1974

REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$ pCi/l		$\beta$ pCi/l		Ra 226 pCi/l	
		Total	Precision*	Total	Precision*	Total	Precision*
7655-1	Arco et al SG#10-1105	9.7	± 2.6	0	± 8	0.3	± 0.4
-2	Base Mine Zone	4.3	± 5.5	0	± 25	0.1	± 0.4
-3	Environmental Cb-1 11/18	3.4	± 2.6	0	± 11		
-4	Arco et al SG#8 Bottom of Mining zone @ 1013	0	± 1.6	0	± 7		
-5	Arco SG#1 Above Base "A" Grove @ 970	1.8	± 2.3	0	± 9		
-6	Environmental Cb-2 11/16	0.4	± 1.6	0	± 8		
-7	Top of Parachute @ 706	4.5	± 2.0	0	± 8	0.3	± 0.5
-8	Arco et al SG#17, #7 DST 1015-1062	11	± 3	0	± 8	0	± 0.4
-9	SG#1-613	1.3	± 1.5	0	± 8		
-10	Arco et al SG#17 DST Depth 808 11/9	1.0	± 1.5	0	± 8		
-11	Environmental Cb-4 11/17	0.8	± 2.5	0	± 11		
-12	Arco et al SG#8 Depth 971	2.6	± 2.0	0	± 8		
	Top of Mining Zone 11/4						
	Arco SG#8 600 ft. 1600 ml 10/26						

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: February 6, 1975  
HRI Project No. 535  
HRI Series No. 7726  
Samples received: Dec. 16, 1974

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\frac{pCl}{I}$		$\frac{pCl}{I}$		Ra	Precision*	Precision*
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$			
✓ 7726-1	SG#17 DST#8	1.7	$\pm$	1.9	$\pm$	15	$\pm$	10	$\pm$	0	$\pm$	1.1
-2	1066-1116.7	4.5	$\pm$	2.8	$\pm$	0	$\pm$	10	$\pm$			
-3	SG-9 String #1	2.3	$\pm$	2.6	$\pm$	2	$\pm$	11	$\pm$			
	SG-9 String #2											

II B-121

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

RECEIVED

FEB 9 1975

TOSCO/GOLDEN

By: *John C. Jarvis*

John C. Jarvis  
Manager, Analytical Laboratory

1/b

# HAZEN RESEARCH, INC.

4601 INDIANA STREET  
GOLDEN, COLORADO • 80401  
TELEPHONE 303/279-4501

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

February 20, 1975

HRI Project No. 535  
HRI Series No. 7836  
Sample Rec'd Jan. 23, 1975

## Determination

7836-1  
SG #17 Environmental Sample  
D.S.T.#34

$\alpha$ -Total (pCi/l)  
 $\alpha$ -Precision\*(pCi/l)

0  
 $\pm 55$

$\beta$ -Total (pCi/l)  
 $\beta$ -Precision\*(pCi/l)

0  
 $\pm 320$

\*Variability of the radioactive disintegration process (counting error)  
at the 95% confidence level,  $1.96\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

ljb

NOTE: Error (Precision) on this sample is high due primarily to the large concentration of soluble salts in the sample and the very small aliquot (2.0 ml) required to keep weight of soluble salts in the planchet being counted within range of standards. To compensate, the alpha was counted for 10 hours and the beta for 8 hours. The values given for total alpha and total beta are considered quite reliable and the analysis of Radium 226, Thorium 230, and Uranium were considered not needed.

THE OIL SHALE CORPORATION  
INTER OFFICE MEMORANDUM

LOS ANGELES ☐  
DENVER ☐  
GOLDEN ☒  
NEW YORK ☐

LABORATORY DATA LETTER 75-47

FROM: F. C. Haas

DATE: March 4, 1975

TO: File

FILE NO.: 5100-3

SUBJECT: Analyses of Water Samples  
from Core Hole SG-8


Project 197

Seven water samples were taken while coring Core Hole SG-8. All samples were analyzed for major constituents and five had a comprehensive analysis done. Major constituent analysis was done by Industrial Laboratories, Denver, Colorado, and TOSCO, Rocky Flats. Minor constituent analysis was done by Industrial Laboratories. Trace metals and total organic carbon was done by Commercial Testing & Engineering Co., Golden, Colorado. Radioactivity was done by Hazen Research, Inc., Golden, Colorado.

There are two discrepancies in the major constituent analyses: (1) On the sample from #2 Jetting at 950' Industrial Laboratories reports 5.5 mg/l Cl where TOSCO found 51 mg/l Cl; (2) On the lower aquifer Industrial Laboratories reports boron of 7 mg/l as  $\text{BO}_2$  where TOSCO found 162 mg/l  $\text{BO}_2$ . Spark source mass spectroscopy by CT&E reported greater than 10 mg/l boron.

Total organic carbon in all samples was less than 10 mg/l.

Gross alpha in one of the samples was greater than 4 p Ci/l; Ra226 was determined and found to be less than 4 p Ci/l.

  
FCH/as  
Enc.

  
Approved (MTA)

cc: R. G. Vawter  
B. L. Schulman  
H. M. Spence  
T. H. Cleveland

A. W. Schillinger  
M. W. Legatski  
D. B. Tait  
J. R. Matis



TABLE 1

## MAJOR CONSTITUENT ANALYSES, SG-8

Component	600'		971'		Bottom of M. Z. Ind.	Top of Garden Gulch, 2117'		TD 2608'		Jetting #2 950'		Lower Aquifer, 1910'	
	Ind.	TOSCO	Ind.	TOSCO		Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO	Ind.	TOSCO
Na, mg/l	170	209	350	470	180	724	784	690	660	2600	2380		
K, mg/l	N.A.	0.4	N.A.	0.6	N.A.	1.8	0.9	N.A.	1.3	N.A.	14		
Ca, mg/l	23	18	6.6	6	7.4	4.5	3.3	12	6	12	6		
Mg, mg/l	33	32	7.7	5	5.5	2.6	1.5	12	4	1.5	4		
SO <sub>4</sub> , mg/l	85	115	<4	<4	<4	23	14	2.5	<4	3	<4		
CO <sub>3</sub> , mg/l	<0.1	18	<0.1	38	6	55	42	72	62	96	252		
HCO <sub>3</sub> , mg/l	510	479	1010	1027	500	1632	1808	1740	1558	5210	4056		
Cl, mg/l	6.9	4	6.9	5	5.5	18	19	5.5	51	840	867		
F, mg/l	9.2	4.5	12	21	10	20	21	12	18	20	23		
Li, mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	N.A.	N.A.	0.6	0.5	6.6	6.8		
BO <sub>2</sub> , mg/l	2.5	1.1	<0.5	4	9.0	N.A.	N.A.	14	10	7	162		
Cations, meq/l	11.26	12.63	16.18	21.16	8.65	31.96	34.38	31.59	29.36	114.7	105.4		
Anions, meq/l	10.87	11.22	17.38	19.44	9.08	30.63	33.01	32.09	30.22	113.6	104.4		
% Difference	1.8	5.8	3.6	4.2	2.4	2.1	2.0	0.8	1.4	0.5	0.5		
SiO <sub>2</sub> , mg/l	19	18	11	10	11	13	14	12	11	17	13		
pH	8.1	9.0	8.1	9.0	8.3	8.9	8.8	8.5	8.7	8.4	9.2		
Calculated TDS, mg/l	599	655	889	1063	479	1662	1786	1685	1587	6156	5717		
Conductivity, micromhos/cm	990	1040	1650	1670	1550	2300	2300	2500	2400	9200	9600		

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74  
DATE REPORTED: 12/9/74

LAB. NUMBER: 5005

55  
SAMPLE MARKED: S0 #8 600 feet 10/26

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

23  
33  
170  
Less than 0.1  
510

1.148  
2.715  
7.395  
---  
8.358

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

6.9  
85  
0.6  
Less than 0.1  
19

---  
1.768  
---  
---  
0.633

Iron  
Fluoride  
P. alkalinity, in terms of  
calcium carbonate  
MO alkalinity, in terms of  
calcium carbonate  
Hardness, in terms of  
calcium carbonate  
Total dissolved solids  
(calculated)

0.11  
9.2  
---  
---  
190  
600

---  
0.484  
---

### MILLIGRAMS PER LITER

Aluminum  
Copper  
Cadmium  
Lead  
Manganese

Less than 0.1  
Less than 0.1  
Less than 0.01  
Less than 0.05  
Less than 0.05

Ammonia-nitrogen  
Lithium  
Barium  
Hexavalent chromium  
Arsenic

0.3  
Less than 0.5  
Less than 1.0  
Less than 0.01  
Less than 0.01

Silver  
Zinc

Less than 0.05  
Less than 0.5

Selenium  
Boron  
Hydroxide

Less than 0.01  
2.5  
Less than 0.1

pH 8.1  
Specific conductance  
990 micromhos per cc

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochoa*  
CHEMIST

II B-125

MEMBER OF:  
AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5006

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	6.6	0.329
Magnesium	7.7	0.634
Sodium	350	16.530
Carbonate	Less than 0.1	---
Bicarbonate	1,010	16.554
Chloride	6.9	---
Sulfate	Less than 4	---
Nitrate	0.3	---
Phosphate	Less than 0.1	---
Silicon dioxide	11	0.366
Iron	Less than 0.05	---
Fluoride	12	0.631
P. alkalinity, in terms of calcium carbonate	---	
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	48	
Total dissolved solids (calculated)	940	
Ammonia-nitrogen	1.1	
Lithium	Less than 0.5	
Barium	Less than 1	
Hexavalent chromium	Less than 0.01	
Arsenic	0.02	
Selenium	Less than 0.01	
Boron	Less than 0.5	
Hydroxide	Less than 0.1	
		MILLIGRAMS PER LITER
		Aluminum
		Copper
		Cadmium
		Lead
		Manganese
		Silver
		Zinc
		pH
		Specific conductance

Less than 0.1  
Less than 0.1  
Less than 0.01  
Less than 0.05  
Less than 0.05

Less than 0.05  
Less than 0.5

8.1  
1,650 micromhos per cc

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul V. ...*

CHEMIST

II B-126

MEMBERS OF:  
AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74  
DATE REPORTED: 12/9/74

LAB. NUMBER: 5015

SAMPLE MARKED: SG #8 11/5 Bottom of Mining Zone

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

7.4  
5.5  
180  
6  
500

0.369  
0.453  
7.830  
---  
8.195

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

5.5  
Less than 4.0  
Less than 0.1  
Less than 0.1  
11

0.366  
---  
---  
---  
0.526

Iron  
Fluoride  
P. alkalinity, in terms of  
calcium carbonate  
MO alkalinity, in terms of  
calcium carbonate  
Hardness, in terms of  
calcium carbonate  
Total dissolved solids  
(calculated)

0.05  
10  
---  
---  
41  
330

### MILLIGRAMS PER LITER

Aluminum  
Copper  
Cadmium  
Lead  
Manganese  
Silver  
Zinc

Less than 0.1  
Less than 0.1  
Less than 0.01  
Less than 0.05  
Less than 0.05  
Less than 0.05  
Less than 0.5

Ammonia-nitrogen  
Lithium  
Barium  
Hexavalent chromium  
Arsenic

0.5  
Less than 0.5  
Less than 1.0  
Less than 0.01  
Less than 0.01

pH 8.3  
Specific conductance 1,550 micromhos  
per cc

Selenium  
Boron  
Hydroxide

Less than 0.01  
2.3  
Less than 0.1

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-127

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ockel*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5941

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: SG 68 12/12/74 9505 Jetting 62

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	12		0.599
Magnesium	12		0.988
Sodium (by flame)	690		30.015
Carbonate	72		2.393
Bicarbonate	1,740		28.536
Chloride	5.5		0.155
Sulfate	2.5		0.052
Nitrate	0.2		---
Phosphate	Less than 0.1		---
Silicon dioxide	12		0.400
Iron	0.31		---
Fluoride	12		0.643
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	80		
Total dissolved solids (calculated)	1,670		
			<u>MILLIGRAMS PER LITER</u>
		Aluminum	Less than 0.1
		Copper	Less than 0.1
		Cadmium	0.5
		Lead	Less than 0.05
		Manganese	Less than 0.05
		Silver	Less than 0.05
		Zinc	Less than 0.5
		Mercury	Less than 0.01
		pH	8.5
		Specific conductance	2,500 micromhos per cc
Amonia-nitrogen	3.3		
Lithium	0.6		
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.05		
Arsenic	0.01		
Selenium	Less than 0.01		
Boron	3.6		
Hydroxide	Less than 0.1		

MEMBERS OF:

cc: Tosco

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*  
CHEMIST

II B-128

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5942

SAMPLE MARKED: SG #3 1,910 Feet 9 AM

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	12	0.599
Magnesium	1.5	0.123
Sodium (by flame)	2,500	113.100
Carbonate	36	3.197
Bicarbonate	5,210	25.444
Chloride	940	23.575
Sulfate	3.0	0.062
Nitrate	0.3	---
Phosphate	Less than 0.1	---
Silicon dioxide	17	0.500
Iron	0.34	---
Fluoride	20	1.072
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	Aluminum
Hardness, in terms of calcium carbonate	35	Less than 0.1
Total dissolved solids (calculated)	6,130	Copper
		Less than 0.1
		Cadmium
		0.04
		Lead
		0.07
		Manganese
		Less than 0.05
Ammonia-nitrogen	24	Silver
Lithium	5.6	Less than 0.05
Barium	Less than 1.0	Zinc
Hexavalent chromium	Less than 0.05	Less than 0.5
Arsenic	Less than 0.01	Mercury
		Less than 0.01
Selenium	Less than 0.01	pH
Boron	1.8	8.4
Hydroxide	Less than 0.1	Specific conductance
		9,200 micromhos per cc

MEMBERS OF:

cc: Tosco

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Vicks*

CHEMIST

II B-129

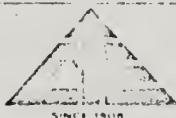
AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401



Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO SG #8 600' 1600 mΩ  
10/26/74

IAD No.: 97-183-002-12

CONCENTRATION IN µg/ml

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.1
Bismuth		Europium		Niobium		Scandium	
Lead	≤0.02	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	0.7	Chlorine	*
Gold		Cerium		Rubidium		Sulfur	*
Platinum		Lanthanum		Bromine	0.009	Phosphorus	0.1
Iridium		Barium	0.03	Selenium		Silicon	*
Osmium		Cesium	0.003	Arsenic	0.004	Aluminum	0.1
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.01	Fluorine	*
Hafnium		Tin		Copper	0.03	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.007	Nitrogen	NR
Ytterbium		Cadmium		Cobalt		Carbon	NR
Thulium		Silver		Iron	0.05	Boron	0.04
Erbium		Palladium		Manganese	0.009	Beryllium	
Holmium		Rhodium		Chromium	0.005	Lithium	0.3
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported <0.004 µg/ml II B-130

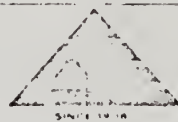
\* Not reported upon request

Approved:

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to



To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO et al SG #8 971

IAD No.: 97-183-002-12

Top of mining zone

11/4/74

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	<0.001
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.2
Bismuth		Europium		Niobium		Scandium	<0.001
Lead	<0.01	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium		Rubidium	0.01	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	0.3
Iridium		Barium	0.2	Selenium	0.003	Silicon	*
Osmium		Cesium	0.006	Arsenic	0.05	Aluminum	0.2
Rhenium		Iodine	0.004	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.02	Fluorine	*
Hafnium		Tin		Copper	0.04	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.04	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.02	Carbon	NR
Thulium		Silver	0.004	Iron	0.06	Boron	1
Erbium		Palladium		Manganese	0.01	Beryllium	
Holmium		Rhodium		Chromium	0.01	Lithium	3
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported <0.002  $\mu\text{g/ml}$

\* Not reported upon request

II B-131

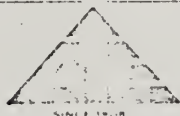
Approved:

*W. J. Sweeney*

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to



To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401

Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO et al SG #8 Bottom of  
mining zone @ 1013'

IAD No.: 97-183-002-12

CONCENTRATION IN µg/ml

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.005
Thorium		Gadolinium		Molybdenum	0.03	Titanium	0.2
Bismuth		Europium		Niobium		Scandium	0.02
Lead	≤0.01	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium		Rubidium	0.02	Sulfur	*
Platinum		Lanthanum		Bromine	0.06	Phosphorus	0.3
Iridium		Barium	0.8	Selenium		Silicon	*
Osmium		Cesium	0.01	Arsenic	0.1	Aluminum	2
Rhenium		Iodine	0.004	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.002	Sodium	*
Tantalum		Antimony	0.002	Zinc	0.1	Fluorine	*
Hafnium		Tin		Copper	0.08	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.04	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.01	Carbon	NR
Thulium		Silver		Iron	0.3	Boron	0.5
Erbium		Palladium		Manganese	0.05	Beryllium	0.004
Holmium		Rhodium		Chromium	0.006	Lithium	3
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported <0.002 µg/ml

\* Not reported upon request

II B-132 Approved:

*M. Sweeney*

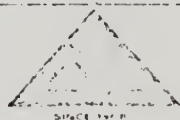


# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-276-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corp.  
18200 West Hiway 72  
Golden, CO 80401



Date: 3 February 75

Analyst: S. Sweeney

P. O. No.:

SG-8

Sample No.: ARCO environmental upper aquifer - conduct- IAD No.: 97-210-002-06  
ivity 2500  $\mu$ -Pkr set @ 950' - Jetting #2  
Filtrate CONCENTRATION IN  $\mu$ g/ml

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.01
Thorium		Gadolinium		Molybdenum	0.03	Titanium	0.05
Bismuth		Europium		Niobium		Scandium	0.002
Lead	$\leq 0.02$	Samarium		Zirconium	0.006	Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	0.7	Chlorine	*
Gold		Cerium		Rubidium	0.02	Sulfur	*
Platinum		Lanthanum		Bromine	0.08	Phosphorus	0.1
Iridium		Barium	0.7	Selenium		Silicon	*
Osmium		Cesium	0.005	Arsenic	0.03	Aluminum	0.2
Rhenium		Iodine	0.02	Germanium	0.005	Magnesium	*
Tungsten		Tellurium		Gallium	0.01	Sodium	*
Tantalum		Antimony		Zinc	0.3	Fluorine	*
Hafnium		Tin		Copper	0.02	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.03	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	$\leq 0.02$	Carbon	NR
Thulium		Silver		Iron	0.4	Boron	2
Erbium		Palladium		Manganese	0.004	Beryllium	
Holmium		Rhodium		Chromium	0.02	Lithium	5
Dysprosium						Hydrogen	NR

NR -- Not Reported

All elements not reported  $< 0.004 \mu\text{g/ml}$  II B-133

\*Not reported upon request

Approved:

*M. J. Jacobs*



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corp.  
18200 West Hiway 72  
Golden, CO 80401

Date: 3 February 75

Analyst: S. Sweeney

P. O. No.:

SG-8

Sample No.: Pkr set at 1910' conductivity 8000 mμ  
temp. 29.5°C  
Filtrate CONCENTRATION IN μg/ml

IAD No.: 97-210-002-06

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.01
Thorium		Gadolinium		Molybdenum	0.03	Titanium	0.1
Bismuth		Europium		Niobium	0.002	Scandium	0.002
Lead	0.02	Samarium		Zirconium	0.03	Calcium	*
Thallium		Neodymium		Yttrium	0.002	Potassium	*
Mercury	NR	Praseodymium		Strontium	1	Chlorine	*
Gold		Cerium		Rubidium	0.09	Sulfur	*
Platinum		Lanthanum	0.004	Bromine	2	Phosphorus	0.6
Iridium		Barium	2	Selenium		Silicon	*
Osmium		Cesium	0.2	Arsenic	0.03	Aluminum	0.2
Rhenium		Iodine	0.7	Germanium	0.007	Magnesium	*
Tungsten		Tellurium		Gallium	0.004	Sodium	*
Tantalum		Antimony		Zinc	0.1	Fluorine	*
Hafnium		Tin		Copper	0.02	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.2	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	≤0.01	Carbon	NR
Thulium		Silver		Iron	0.2	Boron	>10
Erbium		Palladium		Manganese	0.09	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.01	Lithium	>10
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported <0.004 μg/ml II B-134

\*Not reported upon request

Approved:

*M. Jacobs*

RECEIVED

CABLE ADDRESS COMTEL

FEB 7 1975

TOSCO/GOLDEN

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

3 February 75

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401


Re: IAD #97-210-002-06

Analytical Report

TOC\*  
mg/liter

- 1) ARCO environmental sample SG-1 Lower Aquifer  
SG-1 Pkr set @ 1930' 3
- ✓ 2) ARCO environmental upper aquifer - conductivity  
2500 mμ - Pkr set @ 950' - 12/17/74  
Temp. 25.5°C Jetting #2 SG-8 <1
- ✓ 3) ARCO environmental sample lower aquifer SG-8  
Pkr set @ 1910' conductivity 8000 mμ  
Temp. 29.5°C 3

\*Test performed on water marked "Regular"  
Outside Laboratory

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-135



## COMMERCIAL TESTING &amp; ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

9 January 75


Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-183-002-12

Analytical Report

	TOC* mg/liter
Environmental Cb-4 (11-17-74)	-1
Environmental Cb-2 (11-16-74)	-1
Environmental Cb-1 (11-18-74)	1
ARCO SG #1 above Base "A" grove @ 970'	-1
ARCO et al SG #1 @ 1105' Base mine Zone	-1
ARCO et al SG #17 #7 Dst. 1017'-1062'	-1
✓ ARCO et al SG #8 Btm of mining zone @ 1013'	-1
Top of parachute cr @ 706	-1
✓ ARCO et al SG #8 971-Top of mining zone (11-4-74)	-1
SG #1 @ 613'	-1
✓ ARCO SG #8 600' 1600 mΩ 10-26-74	-1
ARCO et al #17 Dst Depth 808' (11-9-74)	6

\*Test performed on water make "Regular".  
Minus sign indicates less than reported value.

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-136



HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: January 2, 1975  
HRI Project No.  
HRI Series No.  
Samples received:

535  
7655  
Nov. 27, 1974

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\text{pCi/l}$		$\text{Ra}$		$\text{pCi/l}$	
		Total	Precision*	Total	Precision*	Total	Precision*	Total	Precision*	Total	Precision*
7655-1	Arco et al SG#10-1105	9.7	± 2.6	0	± 8	0.3	± 0.4	0.3	± 0.4		
-2	Base Mine Zone	4.3	± 5.5	0	± 25	0.1	± 0.4	0.1	± 0.4		
✓-3	Environmental Cb-1 11/18										
	Arco et al SG#8 Bottom of Mining zone @ 1013	3.4	± 2.6	0	± 11						
-4	Arco SG#1 Above Base "A" Grove @ 970	0	± 1.6	0	± 7						
-5	Environmental Cb-2 11/16	1.8	± 2.3	0	± 9						
-6	Top of Parachute @ 706	0.4	± 1.6	0	± 8						
-7	Arco et al SG#17, #7 DST 1015-1062	4.5	± 2.0	0	± 8	0.3	± 0.5	0.3	± 0.5		
-8	SG#1-613	11	± 3	0	± 8	0	± 0.4	0	± 0.4		
-9	Arco et al SG#17 DST Depth 808 11/9	1.3	± 1.5	0	± 8						
-10	Environmental Cb-4 11/17	1.0	± 1.5	0	± 8						
✓-11	Arco et al SG#8 Depth 971										
	Top of Mining Zone 11/4	0.8	± 2.5	0	± 11						
✓-12	Arco SG#8 600 ft. 1600 ml 10/26	2.6	± 2.0	0	± 8						

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: February 19, 1975  
HRI Project No. 535  
HRI Series No. 7791  
Samples received Jan. 6, 1975  
P.O. Number

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	pCi/l		pCi/l	
		$\alpha$	$\alpha$	$\beta$	$\beta$
		Total $\pm$ Precision**	Total $\pm$ Precision**	Total $\pm$ Precision**	Total $\pm$ Precision**
7791-1*	212-83	17 $\pm$ 3	0	0	$\pm$ 10
-2*	ARCO Environmental Sample Lower Aquifer SG-8	24 $\pm$ 15	0	0	$\pm$ 69
-3*	ARCO Environmental Sample Lower Aquifer SG-11	28 $\pm$ 17	0	0	$\pm$ 74
-4	ARCO Environmental Sample Upper Aquifer Setting 2, SG-8	2.1 $\pm$ 3.7	0	0	$\pm$ 16

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

1jb

\*Ra<sup>226</sup> Analysis in progress; results to follow at a later date.

\*\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$



# HAZEN RESEARCH, INC.

## REPORT OF ANALYSIS

Supplement to report dated February 19, 1975

4601 INDIANA STREET  
GOLDEN, COLORADO • 80401  
TELEPHONE 303/279-4501

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: February 27, 1975

HRI Project No. 535  
HRI Series No. 7791  
Samples Rec'd 1/6/75

Analysis No.	Sample Designation	<u>pCi/l</u>	
		Ra <sup>226</sup>	± Precision*
7791-1	212-83	8.4	± 3.8
-2 ✓	ARCO Environmental Sample Lower Aquifer SG-8	2.7	± 2.2
-3	ARCO Environmental Sample Upper Aquifer SG-11	3.0	± 1.9

By:

*Richard P. O'Neil*

John C. Jarvis  
Manager, Analytical Laboratory

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ

amb

II B-139

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# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

Attn: John Matis

DATE RECEIVED: 11/26/78

DATE REPORTED: 3/7/79

LAB. NUMBER: 5015

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: SG #8 11/5 Bottom of Mining Zone

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	8.2		0.409
Magnesium	6.7		0.551
Sodium	840		36.540
Carbonate	7.0		0.400
Bicarbonate	2,245		36.796
Chloride	10		0.282
Sulfate	Less than 4.0		---
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	11		0.566
Iron	0.05		---
Fluoride	10		0.526
P. alkalinity, in terms of calcium carbonate	---		MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	Aluminum	Less than 0.1
Hardness, in terms of calcium carbonate	44	Copper	Less than 0.1
Total dissolved solids (calculated)	2,000	Cadmium	Less than 0.01
		Lead	Less than 0.05
		Manganese	Less than 0.05
Ammonia-nitrogen	0.5	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.01		
Arsenic	Less than 0.01	pH	8.3
Selenium	Less than 0.01	Specific conductance	1,800 micromhos per cm
Boron	2.3		
Hydroxide	Less than 0.1		

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*H. Paul Ochs*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

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ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 11/26/74  
DATE REPORTED: 3/11/75  
LAB. NUMBER: 5015

## SUPPLEMENTAL REPORT

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ECT.) IN ADVANCE.

SAMPLE MARKED: SG #8 11/5 Bottom of Mining Zone

## ANALYSIS:

MO alkalinity, in terms of  
calcium carbonate

1,830 milligrams per liter

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*

CHEMIST

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# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5015

SAMPLE MARKED: SG #8 11/5 Bottom of Mining Zone

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	7.4		0.369
Magnesium	5.5		0.453
Sodium	180		7.830
Carbonate	6		---
Bicarbonate	500		8.195
Chloride	5.5		0.366
Sulfate	Less than 4.0		---
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	11		0.526
Iron	0.05		
Fluoride	10		
P. alkalinity, in terms of calcium carbonate	---	Aluminum	Less than 0.1
MO alkalinity, in terms of calcium carbonate	---	Copper	Less than 0.1
Hardness, in terms of calcium carbonate	41	Cadmium	Less than 0.01
Total dissolved solids (calculated)	330	Lead	Less than 0.05
	470	Manganese	Less than 0.05
Ammonia-nitrogen	0.5	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.01		
Arsenic	Less than 0.01		
Selenium	Less than 0.01		
Boron	2.3		
Hydroxide	Less than 0.1		
		pH	8.3
		Specific conductance	1,550 micromhos per cc

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Olsen*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5942

SAMPLE MARKED: SG #8 1,910 Feet 8 AM

## ANALYSIS:

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC) IN ADVANCE.

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	12	0.599
Magnesium	1.5	0.123
Sodium (by flame)	2,600	113.100
Carbonate	96	3.197
Bicarbonate	5,210	85.444
Chloride	840	23.575
Sulfate	3.0	0.062
Nitrate	0.3	---
Phosphate	Less than 0.1	---
Silicon dioxide	17	0.600
Iron	0.34	---
Fluoride	20	1.072
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	36	Aluminum Less than 0.1
Total dissolved solids (calculated)	6,130	Copper Less than 0.1
		Cadmium 0.04
		Lead 0.07
		Manganese Less than 0.05
Ammonia-nitrogen	24	Silver Less than 0.05
Lithium	6.6	Zinc Less than 0.5
Barium	Less than 1.0	Mercury Less than 0.01
Hexavalent chromium	Less than 0.05	
Arsenic	Less than 0.01	pH 8.4
		Specific conductance 9,200 micromhos per cc
Selenium	Less than 0.01	
Boron	1.8	
Hydroxide	Less than 0.1	

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cc: Tosco

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*H. Paul Beck*

CHEMIST

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Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5941

SAMPLE MARKED: SG #8 12/12/74 950# Jetting #2

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	12	0.599
Magnesium	12	0.988
Sodium (by flame)	690	30.015
Carbonate	72	2.398
Bicarbonate	1,740	28.536
Chloride	5.5	0.155
Sulfate	2.5	0.052
Nitrate	0.2	---
Phosphate	Less than 0.1	---
Silicon dioxide	12	0.400
Iron	0.31	---
Fluoride	12	0.643
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	Aluminum
Hardness, in terms of calcium carbonate	80	Less than 0.1
Total dissolved solids (calculated)	1,670	Copper
		Less than 0.1
		Cadmium
		0.5
		Lead
		Less than 0.05
		Manganese
		Less than 0.05
Ammonia-nitrogen	3.3	Silver
Lithium	0.6	Less than 0.05
Barium	Less than 1.0	Zinc
Hexavalent chromium	Less than 0.05	Less than 0.5
Arsenic	0.01	Mercury
		Less than 0.01
Selenium	Less than 0.01	pH
Boron	3.6	8.5
Hydroxide	Less than 0.1	Specific conductance
		2,500 micromhos per cc

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cc: Tosco

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Vicks*

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5006

56

SAMPLE MARKED: Et A1 #8 971 feet Top 11/4

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	6.6	0.329
Magnesium	7.7	0.634
Sodium	350	16.530
Carbonate	Less than 0.1	---
Bicarbonate	1,010	16.554
Chloride	6.9	---
Sulfate	Less than 4	---
Nitrate	0.3	---
Phosphate	Less than 0.1	---
Silicon dioxide	11	0.366
Iron	Less than 0.05	----
Fluoride	12	0.631
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	48	Aluminum Less than 0.1
Total dissolved solids (calculated)	940	Copper Less than 0.1
		Cadmium Less than 0.01
		Lead Less than 0.05
		Manganese Less than 0.05
Ammonia-nitrogen	1.1	Silver Less than 0.05
Lithium	Less than 0.5	Zinc Less than 0.5
Barium	Less than 1	
Hexavalent chromium	Less than 0.01	
Arsenic	0.02	pH 8.1
		Specific conductance
Selenium	Less than 0.01	1,650 micromhos per cc
Boron	Less than 0.5	
Hydroxide	Less than 0.1	

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THE INDUSTRIAL LABORATORIES COMPANY

H. Paul Vachon

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5005

SAMPLE MARKED: <sup>55</sup> SO #8 600 feet 10/26

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE

## ANALYSIS:

	<u>MILLIGRAMS PER LITER</u>	<u>MILLI-EQUIVALENTS</u>	
Calcium	23	1.148	
Magnesium	33	2.715	
Sodium	170	7.395	
Carbonate	Less than 0.1	---	
Bicarbonate	510	8.358	
Chloride	6.9	---	
Sulfate	85	1.768	
Nitrate	0.6	---	
Phosphate	Less than 0.1	---	
Silicon dioxide	19	0.633	
Iron	0.11	---	
Fluoride	9.2	0.484	
P. alkalinity, in terms of calcium carbonate	---	<u>MILLIGRAMS PER LITER</u>	
MO alkalinity, in terms of calcium carbonate	---	Aluminum	Less than 0.1
Hardness, in terms of calcium carbonate	190	Copper	Less than 0.1
Total dissolved solids (calculated)	600	Cadmium	Less than 0.01
		Lead	Less than 0.05
		Manganese	Less than 0.05
Ammonia-nitrogen	0.3	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.01		
Arsenic	Less than 0.01		
Selenium	Less than 0.01	pH	8.1
Boron	2.5	Specific conductance	
Hydroxide	Less than 0.1	990 micromhos per cc	

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*  
CHEMIST









## II B-5

### BASELINE GROUND WATER QUALITY DATA

Several wells or core holes have been drilled, completed and sampled as part of the ground water baseline monitoring network. The analyses of some of those initial baseline samples are included in this segment of Quarterly Report #2. Some data appeared in Quarterly Report #1 as upper zone samples during drilling, alluvial well samples, and monitoring samples. In the future, most ground water analytical data will appear in the Baseline Water Quality Section of the quarterly reports. Drilling activity, and hence drilling water data, will be greatly reduced in 1975.

On a semi-annual basis ground water samples will be collected from all appropriate well bores and analyzed for baseline documentation. The constituent list may change from time to time as criteria are reviewed and modified.

The Project is now five months into the first year of baseline documentation. Therefore, in April (extending into May) the next major ground water sampling run will commence. Data from that sampling run may or may not be available for Quarterly Report #3, depending on analytical lag time. Until those samples are collected and analyzed, detailed ground water quality interpretation and/or correlation, based upon the baseline ground water monitoring network, would be inappropriate.

TABLE II B5.1

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: Cb-1

Date	11-18-74				
1. Aluminum (ug/l)	.05				
2. Ammonia (mg/l)	2.1				
3. Arsenic (ug/l)	.002				
4. Barium (ug/l)	.08				
5. Beryllium (ug/l)	< .002				
6. Bicarbonate (mg/l)	2570				
7. Bismuth (ug/l)	< .002				
8. Boron (ug/l)	.7				
9. Cadmium (ug/l)	< .002				
10. Calcium (mg/l)	9.4				
11. Carbonate (mg/l)	< .1				
12. Cerium (mg/l)	< .002				
13. Chloride (mg/l)	82				
14. Chrome, Hexavalent	.006				
15. Cobalt (ug/l)	.01				
16. Conductivity, Specific (u <sub>r</sub> )	3800				
17. Copper (ug/l)	.09				
18. Fluoride (mg/l)	16				
19. Gallium (ug/l)	< .002				
20. Hardness, Total	35				
21. Hydroxide (mg/l)	< .1				
22. Iron (ug/l)	.3				
23. Lead (ug/l)	< .008				
24. Lithium (ug/l)	.3				
25. Magnesium (mg/l)	8.2				
26. Manganese (ug/l)	.2				
27. Mercury (ug/l)	-				
28. Molybdenum (ug/l)	.02				
29. Nickel (ug/l)	.009				
30. Nitrate (mg/l)	.5				
31. pH	8.2				
32. Phosphate, Total	< .1				
33. Potassium (mg/l)	9				
34. Selenium (ug/l)	< .002				
35. Silica (mg/l)	11				
(*) 36. Silver (ug/l)	< .002				
37. Sodium (mg/l)	980				
38. Solids, Dissolved (mg/l)	2566				
39. Strontium (ug/l)	.4				
40. Sulfate (mg/l)	< 4				
41. Titanium (ug/l)	.05				
42. Vanadium (ug/l)	.002				
43. Yttrium (mg/l)	< .002				
44. Zinc (ug/l)	.04				
45. Zirconium (ug/l)	< .002				
46. Radioactivity					
Gross Alpha (pci)	4.3				
Radium 226**	0.1				
Gross Beta (pci)	0				
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l/l then measure					
Dissolved Organic Carbon	< 1				
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).

TABLE 11 B5.2

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: Ch-2

Date	11-16-74				
1. Aluminum (ug/l)	.15				
2. Ammonia (mg/l)	.5				
3. Arsenic (ug/l)	.02				
4. Barium (ug/l)	.01				
5. Beryllium (ug/l)	< .001				
6. Bicarbonate (mg/l)	450				
7. Bismuth (ug/l)	.005				
8. Boron (ug/l)	2.9				
9. Cadmium (ug/l)	< .002				
10. Calcium (mg/l)	8.2				
11. Carbonate (mg/l)	3.6				
12. Cerium (mg/l)	< .002				
13. Chloride (mg/l)	9.6				
14. Chrome, Hexavalent	.03				
15. Cobalt (ug/l)	.002				
16. Conductivity, Specific (uS)	1600				
17. Copper (ug/l)	3				
18. Fluoride (mg/l)	2.9				
19. Gallium (ug/l)	.003				
20. Hardness, Total	39				
21. Hydroxide (mg/l)	< .1				
22. Iron (ug/l)	.5				
23. Lead (ug/l)	.02				
24. Lithium (ug/l)	3				
25. Magnesium (mg/l)	4.5				
26. Manganese (ug/l)	.1				
27. Mercury (ug/l)	-				
28. Molybdenum (ug/l)	.04				
29. Nickel (ug/l)	.02				
30. Nitrate (mg/l)	.3				
31. pH	8.4				
32. Phosphate, Total	< .1				
33. Potassium (mg/l)	3.0				
34. Selenium (ug/l)	< .002				
35. Silica (mg/l)	17				
(*) 36. Silver (ug/l)	< .002				
37. Sodium (mg/l)	350				
38. Solids, Dissolved (mg/l)	976				
39. Strontium (ug/l)	.7				
40. Sulfate (mg/l)	360				
41. Titanium (ug/l)	.07				
42. Vanadium (ug/l)	.002				
43. Yttrium (mg/l)	< .002				
44. Zinc (ug/l)	.4				
45. Zirconium (ug/l)	< .002				
46. Radioactivity					
Gross Alpha (pCi)	1.8				
Radium 226*					
Gross Beta (pCi)	0				
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure					
Dissolved Organic Carbon	< 1				
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).



TABLE II B5.3

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: Cb-4

Date	11-17-74				
1.	Aluminum (ug/l)	c			
2.	Ammonia (mg/l)	.4			
3.	Arsenic (ug/l)	.01			
4.	Barium (ug/l)	.02			
5.	Beryllium (ug/l)	< .001			
6.	Bicarbonate (mg/l)	360			
7.	Bismuth (ug/l)	< .002			
8.	Boron (ug/l)	2.8			
9.	Cadmium (ug/l)	< .002			
10.	Calcium (mg/l)	30			
11.	Carbonate (mg/l)	< .1			
12.	Cerium (mg/l)	< .002			
13.	Chloride (mg/l)	6.9			
14.	Chrome, Hexavalent	.03			
15.	Cobalt (ug/l)	< .002			
16.	Conductivity, Specific (u $\sigma$ )	840			
17.	Copper (ug/l)	.5			
18.	Fluoride (mg/l)	1.0			
19.	Gallium (ug/l)	.003			
20.	Hardness, Total	180			
21.	Hydroxide (mg/l)	< .1			
22.	Iron (ug/l)	.3			
23.	Lead (ug/l)	< .01			
24.	Lithium (ug/l)	.3			
25.	Magnesium (mg/l)	28			
26.	Manganese (ug/l)	.1			
27.	Mercury (ug/l)				
28.	Molybdenum (ug/l)	.02			
29.	Nickel (ug/l)	.02			
30.	Nitrate (mg/l)	.2			
31.	pH	7.7			
32.	Phosphate, Total	< .1			
33.	Potassium (mg/l)	.4			
34.	Selenium (ug/l)	< .002			
35.	Silica (mg/l)	24			
(*) 36.	Silver (ug/l)	< .002			
37.	Sodium (mg/l)	150			
38.	Solids, Dissolved (mg/l)	574			
39.	Strontium (ug/l)	2			
40.	Sulfate (mg/l)	160			
41.	Titanium (ug/l)	.08			
42.	Vanadium (ug/l)	.001			
43.	Yttrium (mg/l)	< .002			
44.	Zinc (ug/l)	.07			
45.	Zirconium (ug/l)	< .002			
46.	Radioactivity				
	Gross Alpha (pci)	1.0			
	Radium 226**				
	Gross Beta (pci)	0			
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure				
	Dissolved Organic Carbon	< 1			
	Suspended Organic Carbon				
	Phenols				
	Sulfur, Acid Extract				
	Nitrogen, Base Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).

a. date on laboratory analysis

c - error



TABLE II B5.4WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: AT-1c, String #1 1550'-1640'

Date	11-17-74				
1.	Aluminum (ug/l)	.9			
2.	Ammonia (mg/l)	.12			
3.	Arsenic (ug/l)	.03			
4.	Barium (ug/l)	.04			
5.	Beryllium (ug/l)	< .001			
6.	Bicarbonate (mg/l)	780			
7.	Bismuth (ug/l)	< .003			
8.	Boron (ug/l)	1.1			
9.	Cadmium (ug/l)	.003			
10.	Calcium (mg/l)	3.7			
11.	Carbonate (mg/l)	160			
12.	Cerium (mg/l)	< .003			
13.	Chloride (mg/l)	36			
14.	Chromium, Hexavalent	.003			
15.	Cobalt (ug/l)	.006			
16.	Conductivity, Specific (u $\sigma$ )	1420			
17.	Copper (ug/l)	.1			
18.	Fluoride (mg/l)	10			
19.	Gallium (ug/l)	.002			
20.	Hardness, Total	26			
21.	Hydroxide (mg/l)	< .1			
22.	Iron (ug/l)	.2			
23.	Lead (ug/l)	.02			
24.	Lithium (ug/l)	5			
25.	Magnesium (mg/l)	4.1			
26.	Manganese (ug/l)	.06			
27.	Mercury (ug/l)	.0019			
28.	Molybdenum (ug/l)	.07			
29.	Nickel (ug/l)	.02			
30.	Nitrate (mg/l)	< .1			
31.	pH	9.0			
32.	Phosphate, Total	.1			
33.	Potassium (mg/l)	-			
34.	Selenium (ug/l)	< .003			
35.	Silica (mg/l)	12			
(*) 36.	Silver (ug/l)	< .003			
37.	Sodium (mg/l)	520			
38.	Solids, Dissolved (mg/l)	1224			
39.	Strontium (ug/l)	.4			
40.	Sulfate (mg/l)	96			
41.	Titanium (ug/l)	.08			
42.	Vanadium (ug/l)	.003			
43.	Yttrium (mg/l)	< .003			
44.	Zinc (ug/l)	.2			
45.	Zirconium (ug/l)	.004			
46.	Radioactivity				
	Gross Alpha (pCi)	4			
	Radium 226*				
	Gross Beta (pCi)	41			
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure				
	Dissolved Organic Carbon	< 1			
	Suspended Organic Carbon				
	Phenols				
	Sulfur, Acid Extract				
	Nitrogen, Base Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B5.5

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: AT-1c, String #2, 1450' - 1480'

Date	11-7-74				
1.	Aluminum (ug/l)	.5			
2.	Ammonia (mg/l)	.17			
3.	Arsenic (ug/l)	.05			
4.	Barium (ug/l)	.1			
5.	Beryllium (ug/l)	.002			
6.	Bicarbonate (mg/l)	465			
7.	Bismuth (ug/l)	<.008			
8.	Boron (ug/l)	1.4			
9.	Cadmium (ug/l)	<.008			
10.	Calcium (mg/l)	37			
11.	Carbonate (mg/l)	<.1			
12.	Cerium (ug/l)	<.008			
13.	Chloride (mg/l)	3			
14.	Chromium, Hexavalent	.005			
15.	Cobalt (ug/l)	.003			
16.	Conductivity, Specific (uS)	1350			
17.	Copper (ug/l)	.03			
18.	Fluoride (mg/l)	8.8			
19.	Gallium (ug/l)	<.008			
20.	Hardness, Total	200			
21.	Hydroxide (mg/l)	<.1			
22.	Iron (ug/l)	.18			
23.	Lead (ug/l)	.05			
24.	Lithium (ug/l)	4			
25.	Magnesium (mg/l)	27			
26.	Manganese (ug/l)	.2			
27.	Mercury (ug/l)	.0009			
28.	Molybdenum (ug/l)	.1			
29.	Nickel (ug/l)	.006			
30.	Nitrate (mg/l)	<.1			
31.	pH	7.9			
32.	Phosphate, Total	<.1			
33.	Potassium (mg/l)	6.4			
34.	Selenium (ug/l)	<.008			
35.	Silica (mg/l)	15			
(*) 36.	Silver (ug/l)	<.008			
37.	Sodium (mg/l)	220			
38.	Solids, Dissolved (mg/l)	810			
39.	Strontium (ug/l)	5			
40.	Sulfate (mg/l)	230			
41.	Titanium (ug/l)	.1			
42.	Vanadium (ug/l)	.002			
43.	Yttrium (ug/l)	<.008			
44.	Zinc (ug/l)	.05			
45.	Zirconium (ug/l)	<.008			
46.	Radioactivity				
	Gross Alpha (pCi)	1.6			
	Radium 226*				
	Gross Beta (pCi)	0			
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure	<1			
	Dissolved Organic Carbon				
	Suspended Organic Carbon				
	Phenols				
	Sulfur, Acid Extract				
	Nitrogen, Base Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B5.6

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: AT-1c, String #3, 60'-1250'

Date	11-7-74				
1.	Aluminum (ug/l)	.9			
2.	Ammonia (mg/l)	.23			
3.	Arsenic (ug/l)	.06			
4.	Barium (ug/l)	.02			
5.	Beryllium (ug/l)	<.002			
6.	Bicarbonate (mg/l)	452			
7.	Bismuth (ug/l)	.002			
8.	Boron (ug/l)	1.3			
9.	Cadmium (ug/l)	<.002			
10.	Calcium (mg/l)	15			
11.	Carbonate (mg/l)	9			
12.	Cerium (mg/l)	<.002			
13.	Chloride (mg/l)	7			
14.	Chrome, Hexavalent	.006			
15.	Cobalt (ug/l)	.002			
16.	Conductivity, Specific (u $\sigma$ )	1200			
17.	Copper (ug/l)	.03			
18.	Fluoride (mg/l)	6.4			
19.	Gallium (ug/l)	<.002			
20.	Hardness, Total	150			
21.	Hydroxide (mg/l)	.1			
22.	Iron (ug/l)	.28			
23.	Lead (ug/l)	.01			
24.	Lithium (ug/l)	.5			
25.	Magnesium (mg/l)	23			
26.	Manganese (ug/l)	.2			
27.	Mercury (ug/l)	.008			
28.	Molybdenum (ug/l)	.02			
29.	Nickel (ug/l)	.01			
30.	Nitrate (mg/l)	.1			
31.	pH	8.6			
32.	Phosphate, Total	.1			
33.	Potassium (mg/l)	3.6			
34.	Selenium (ug/l)	<.002			
35.	Silica (mg/l)	18			
(*) 36.	Silver (ug/l)	<.002			
37.	Sodium (mg/l)	221			
38.	Solids, Dissolved (mg/l)	750			
39.	Strontium (ug/l)	2			
40.	Sulfate (mg/l)	226			
41.	Titanium (ug/l)	.08			
42.	Vanadium (ug/l)	<.001			
43.	Yttrium (mg/l)	<.002			
44.	Zinc (ug/l)	.05			
45.	Zirconium (ug/l)	<.002			
46.	Radioactivity				
	Gross Alpha (pci)	2			
	Radium 226*				
	Gross Beta (pci)	2			
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure				
	Dissolved Organic Carbon	< 1			
	Suspended Organic Carbon				
	Phenols				
	Sulfur, Acid Extract				
	Nitrogen, Base Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).



TABLE II B5.7

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORING

Well Number: SG-9, String #1

1.	Aluminum (ug/l)	.4			
2.	Ammonia (mg/l)	.1			
3.	Arsenic (ug/l)	.02			
4.	Barium (ug/l)	.08			
5.	Beryllium (ug/l)	.001			
6.	Bicarbonate (mg/l)	860			
7.	Bismuth (ug/l)	< .002			
8.	Boron (ug/l)	4.9			
9.	Cadmium (ug/l)	.1			
10.	Calcium (mg/l)	19			
11.	Carbonate (mg/l)	72			
12.	Cerium (mg/l)	.002			
13.	Chloride (mg/l)	44			
14.	Chrome, Hexavalent	.006			
15.	Cobalt (ug/l)	.002			
16.	Conductivity, Specific (u/r)	1500			
17.	Copper (ug/l)	.03			
18.	Fluoride (mg/l)	18			
19.	Gallium (ug/l)	.003			
20.	Hardness, Total	78.			
21.	Hydroxide (mg/l)	< .1			
22.	Iron (ug/l)	.68			
23.	Lead (ug/l)	.01			
24.	Lithium (ug/l)	.22			
25.	Magnesium (mg/l)	7.5			
26.	Manganese (ug/l)	.09			
27.	Mercury (ug/l)	-			
28.	Molybdenum (ug/l)	.07			
29.	Nickel (ug/l)	.003			
30.	Nitrate (mg/l)	< .1			
31.	pH	8.6			
32.	Phosphate, Total	< .1			
33.	Potassium (mg/l)	5.3			
34.	Selenium (ug/l)	.005			
35.	Silica (mg/l)	15			
(*) 36.	Silver (ug/l)	.009			
37.	Sodium (mg/l)	400			
38.	Solids, Dissolved (mg/l)	1050			
39.	Strontium (ug/l)	2			
40.	Sulfate (mg/l)	51			
41.	Titanium (ug/l)	.1			
42.	Vanadium (ug/l)	.002			
43.	Yttrium (mg/l)	< .002			
44.	Zinc (ug/l)	1			
45.	Zirconium (ug/l)	< .002			
46.	Radioactivity				
	Gross Alpha (pci)	4.5			
	Radium 226*	0			
	Gross Beta (pci)	0			
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure				
	Dissolved Organic Carbon	< 1			
	Suspended Organic Carbon				
	Phenols				
	Sulfur, Acid Extract				
	Nitrogen, Base Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pci).

\*\* Required if gross beta is greater than 100 picocuries per liter (pci).

TABLE II B5.8

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: SG-9, String #2.

1.	Aluminum (ug/l)	.7				
2.	Ammonia (mg/l)	.2				
3.	Arsenic (ug/l)	.009				
4.	Barium (ug/l)	.07				
5.	Beryllium (ug/l)	.003				
6.	Bicarbonate (mg/l)	690				
7.	Bismuth (ug/l)	<.004				
8.	Boron (ug/l)	1.5				
9.	Cadmium (ug/l)	<.004				
10.	Calcium (mg/l)	117				
11.	Carbonate (mg/l)	42				
12.	Cerium (mg/l)	<.004				
13.	Chloride (mg/l)	60				
14.	Chromium, Hexavalent	.01				
15.	Cobalt (ug/l)	.01				
16.	Conductivity, Specific (uM)	1640				
17.	Copper (ug/l)	.03				
18.	Fluoride (mg/l)	.2				
19.	Gallium (ug/l)	<.004				
20.	Hardness, Total	570				
21.	Hydroxide (mg/l)	<.1				
22.	Iron (ug/l)	.18				
23.	Lead (ug/l)	<.02				
24.	Lithium (ug/l)	.27				
25.	Magnesium (mg/l)	68				
26.	Manganese (ug/l)	.4				
27.	Mercury (ug/l)	-				
28.	Molybdenum (ug/l)	.08				
29.	Nickel (ug/l)	.02				
30.	Nitrate (mg/l)	.4				
31.	pH	8.8				
32.	Phosphate, Total	<.1				
33.	Potassium (mg/l)	4.8				
34.	Selenium (ug/l)	.009				
35.	Silica (mg/l)	22				
(*) 36.	Silver (ug/l)	<.004				
37.	Sodium (mg/l)	310				
38.	Solids, Dissolved (mg/l)	1352				
39.	Strontium (ug/l)	3				
40.	Sulfate (mg/l)	375				
41.	Titanium (ug/l)	.05				
42.	Vanadium (ug/l)	.004				
43.	Yttrium (mg/l)	<.004				
44.	Zinc (ug/l)	.1				
45.	Zirconium (ug/l)	<.004				
46.	Radioactivity					
	Gross Alpha (pCi)	1.7				
	Radium 226*					
	Gross Beta (pCi)	15				
	Thorium 230**					
	Uranium**					
47.	Total Organic Carbon (TOC)					
	If TOC > 10 mg/l then measure					
	Dissolved Organic Carbon	8				
	Suspended Organic Carbon					
	Phenols					
	Sulfur, Acid Extract					
	Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).



TABLE II B5.9

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: SG-11, String No. 1, Lower Aquifer

Date	11/2/74				
1.	Aluminum (ug/l)	0.4			
2.	Ammonia (mg/l)	-			
3.	Arsenic (ug/l)	.03			
4.	Barium (ug/l)	5			
5.	Beryllium (ug/l)	.002			
6.	Bicarbonate (mg/l)	21,594			
7.	Bismuth (ug/l)	<.006			
8.	Boron (ug/l)	315			
9.	Cadmium (ug/l)	<.006			
10.	Calcium (mg/l)	6			
11.	Carbonate (mg/l)	1962			
12.	Cerium (mg/l)	<.006			
13.	Chloride (mg/l)	8154			
14.	Chrome, Hexavalent	.007			
15.	Cobalt (ug/l)	.03			
16.	Conductivity, Specific (u $\sigma$ )	40,000			
17.	Copper (ug/l)	0.2			
18.	Fluoride (mg/l)	48			
19.	Gallium (ug/l)	.02			
20.	Hardness, Total	48			
21.	Hydroxide (mg/l)	<.1			
22.	Iron (ug/l)	3			
23.	Lead (ug/l)	.03			
24.	Lithium (ug/l)	79			
25.	Magnesium (mg/l)	14			
26.	Manganese (ug/l)	.07			
27.	Mercury (ug/l)	.0026			
28.	Molybdenum (ug/l)	.01			
29.	Nickel (ug/l)	-			
30.	Nitrate (mg/l)	.1			
31.	pH	8.8			
32.	Phosphate, Total	.1			
33.	Potassium (mg/l)	125			
34.	Selenium (ug/l)	<.006			
35.	Silica (mg/l)	24			
(*) 36.	Silver (ug/l)	<.006			
37.	Sodium (mg/l)	16,367			
38.	Solids, Dissolved (mg/l)	38,592			
39.	Strontium (ug/l)	3			
40.	Sulfate (mg/l)	2			
41.	Titanium (ug/l)	.2			
42.	Vanadium (ug/l)	.02			
43.	Yttrium (mg/l)	.03			
44.	Zinc (ug/l)	.03			
45.	Zirconium (ug/l)	.9			
46.	Radioactivity				
	Gross Alpha (pCi)	43			
	Radium 226*	27			
	Gross Beta (pCi)	390			
	Thorium 230**	0			
	Uranium**	0			
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l then measure	29			
	Dissolved Organic Carbon				
	Suspended Organic Carbon	11			
	Phenols	5			
	Sulfur, Acid Extract				
	Nitrogen, Lase Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

TABLE II B5.10

WATER QUALITY ANALYSIS  
ENVIRONMENTAL BASELINE MONITORINGWell Number: SG-19

Date	11/1/74				
1.	Aluminum (ug/l)	.3			
2.	Ammonia (mg/l)	.14			
3.	Arsenic (ug/l)	<.001			
4.	Barium (ug/l)	.2			
5.	Beryllium (ug/l)	<.002			
6.	Bicarbonate (mg/l)	1780			
7.	Bismuth (ug/l)	<.002			
8.	Boron (ug/l)	2.0			
9.	Cadmium (ug/l)	<.002			
10.	Calcium (mg/l)	6.6			
11.	Carbonate (mg/l)	66			
12.	Cerium (mg/l)	<.002			
13.	Chloride (mg/l)	10			
14.	Chrome, Hexavalent	.002			
15.	Cobalt (ug/l)	<.001			
16.	Conductivity, Specific (uS)	2750			
17.	Copper (ug/l)	.08			
18.	Fluoride (mg/l)	3.1			
19.	Gallium (ug/l)	.002			
20.	Hardness, Total	29			
21.	Hydroxide (mg/l)	<.1			
22.	Iron (ug/l)	.05			
23.	Lead (ug/l)	<.008			
24.	Lithium (ug/l)	.8			
25.	Magnesium (mg/l)	2.9			
26.	Manganese (ug/l)	.002			
27.	Mercury (ug/l)	.0019			
28.	Molybdenum (ug/l)	.003			
29.	Nickel (ug/l)	.002			
30.	Nitrate (mg/l)	<.1			
31.	pH	8.4			
32.	Phosphate, Total	<.1			
33.	Potassium (mg/l)	-			
34.	Selenium (ug/l)	<.002			
35.	Silica (mg/l)	9			
(*) 36.	Silver (ug/l)	<.002			
37.	Sodium (mg/l)	755			
38.	Solids, Dissolved (mg/l)	1810			
39.	Strontium (ug/l)	.4			
40.	Sulfate (mg/l)	<.1			
41.	Titanium (ug/l)	.03			
42.	Vanadium (ug/l)	<.001			
43.	Yttrium (mg/l)	<.002			
44.	Zinc (ug/l)	.05			
45.	Zirconium (ug/l)	.002			
46.	Radioactivity				
	Gross Alpha (pCi)	7.9			
	Radium 226*	0.1			
	Gross Beta (pCi)	55			
	Thorium 230**				
	Uranium**				
47.	Total Organic Carbon (TOC)				
	If TOC > 10 mg/l/l then measure				
	Dissolved Organic Carbon	<.1			
	Suspended Organic Carbon				
	Phenols				
	Sulfur, Acid Extract				
	Nitrogen, Base Extract				

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

# THE OIL SHALE CORPORATION

## INTER OFFICE MEMORANDUM

NEW YORK ☐  
DENVER ☒  
LOS ANGELES ☐

LABORATORY DATA LETTER 75-26

FROM: F. C. Haas

DATE:

February 12, 1975

TO: File

FILE NO.:

5100-3

SUBJECT:

Analyses of Environmental  
Water Samples from Core  
Hole Nos. C-b-1, C-b-2 and  
C-b-4

Project No. 197

Three water samples were taken from core hole Nos. C-b-1, C-b-2 and C-b-4. Samples were taken on 11-16-74 (C-b-2), 11-17-74 (C-b-4) and 11-18-74 (C-b-1). These samples were analyzed for major and minor constituents, trace metals, radioactivity and total organic carbon. Major constituent analyses were done by Industrial Laboratories, Denver, Colorado, and TOSCO, Rocky Flats. Minor constituent analyses were done by Industrial Laboratories. Trace metals and total organic carbon were done by Commercial Testing & Engineering, Golden, Colorado. Radioactivity was done by Hazen Research, Inc. Results of the analyses are attached.

Industrial Laboratories pH results are about 0.5 pH units lower than TOSCOs'. This then reflects in the carbonate values; the lower the pH measures, the lower the carbonate. This is probably not too important, as the true pH value is the pH taken at the sample site (pH changes with time).

Total organic carbon in all samples was less than 10 mg/liter.

The sample from C-b-1 contained greater than 4 pCi/l of gross alpha radiation; Ra<sub>226</sub> was then determined, but was found to be less than 4 pCi/l.

*FCH*  
FCH/aw  
Encs.

cc: Messrs. Vawter, Spence,  
Schulman, Cleveland, Schillinger,  
Legatski (ARCO), Matis (ARCO) and  
Tait (ARCO)

*MTA*  
Approved (MTA)

Table 1

ENVIRONMENTAL SAMPLES FROM  
CORE HOLES C-b-1, C-b-2 AND C-b-4  
(MAJOR CONSTITUENT ANALYSES)

<u>Component</u>	<u>C-b-1</u>		<u>C-b-2</u>		<u>C-b-4</u>	
	<u>Industrial</u>	<u>TOSCO</u>	<u>Industrial</u>	<u>TOSCO</u>	<u>Industrial</u>	<u>TOSCO</u>
Sodium, mg/l	980	1090	350	381	150	127
Potassium, mg/l	NA	9.0	NA	3.0	NA	0.4
Calcium, mg/l	9.4	4.2	8.2	6.0	30	22
Magnesium, mg/l	8.2	3.8	4.5	3.8	28	23
Sulfate, mg/l	<4	ND	360	333	160	140
Carbonate, mg/l	<0.1	62.4	3.6	24	<0.1	5
Bicarbonate, mg/l	2570	2541	450	499	360	351
Chloride, mg/l	82	64	9.6	10	6.9	2.3
Fluoride, mg/l	16	26	2.9	1	1.0	0.3
Σ Cations, meq/l	43.77	48.20	16.00	17.25	10.33	8.54
Σ Anions, meq/l	45.28	46.92	15.02	16.26	9.42	8.93
% Difference	1.7	1.1	3.3	3.0	4.6	2.2
Silica, mg/l	11	12	17	17	24	23
pH	8.2	8.7	8.4	8.9	7.7	8.4
Conductivity, μmhos/cm	3800	3900	1600	1600	840	850
Calculated TDS, mg/l	2366	2514	976	1024	574	515

NA - Not Analyzed.  
ND - Not Detected.



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74  
DATE REPORTED: 12/9/74

LAB. NUMBER: 5002

SAMPLE MARKED: Cb1 - 11/18

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER	MILLI-EQUIVALENTS
Calcium	9.4	0.469
Magnesium	8.2	0.675
Sodium	980	42.630
Carbonate	Less than 0.1	---
Bicarbonate	2,570	42.122
Chloride	82	2.313
Sulfate	Less than 4	---
Nitrate	0.5	---
Phosphate	Less than 0.1	---
Silicon dioxide	11	0.366
Iron	Less than 0.05	---
Fluoride	16	0.842
P. alkalinity, in terms of calcium carbonate	---	MILLIGRAMS PER LITER
MO alkalinity, in terms of calcium carbonate	---	
Hardness, in terms of calcium carbonate	35	Aluminum Less than 0.1
Total dissolved solids (calculated)	2,400	Copper Less than 0.1
		Cadmium Less than 0.01
		Lead Less than 0.05
		Manganese Less than 0.05
Ammonia-nitrogen	2.1	Silver Less than 0.05
Lithium	Less than 0.5	Zinc Less than 0.5
Barium	Less than 1.0	
Hexavalent chromium	Less than 0.01	
Arsenic	Less than 0.01	pH 8.2
		Specific conductance 3,800 micromhos per
Selenium	Less than 0.01	
Boron	0.7	
Hydroxide	Less than 0.1	

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BATTERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-160

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5003

SAMPLE MARKED: CB2 11/16

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

8.2  
4.5  
350  
3.6  
450

0.409  
0.370  
15.225  
---  
7.375

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

9.6  
360  
0.3  
Less than 0.1  
17

---  
7.495  
---  
---  
0.516

Iron  
Fluoride  
P. alkalinity, in terms of calcium carbonate  
MO alkalinity, in terms of calcium carbonate  
Hardness, in terms of calcium carbonate  
Total dissolved solids (calculated)

0.33  
2.9  
---  
---  
39  
980

### MILLIGRAMS PER LITER

Aluminum 0.15  
Copper Less than 0.1  
Cadmium Less than 0.01  
Lead Less than 0.05  
Manganese Less than 0.05  
Silver Less than 0.05  
Zinc Less than 0.5

Ammonia-nitrogen  
Lithium  
Barium  
Hexavalent chromium  
Arsenic

0.5  
Less than 0.5  
Less than 1  
Less than 0.01  
Less than 0.01

pH 8.4  
Specific conductance 1,600 micromhos per cc

Selenium  
Boron  
Hydroxide

Less than 0.01  
2.9  
Less than 0.1

MEMBERS OF: XXXXXXXX

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-161

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul V. ...*

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/26/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 5004

SAMPLE MARKED: Cb4 11/17

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

30  
28  
150  
Less than 0.1  
360

1.497  
2.304  
6.525  
---  
5.900

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

6.9  
160  
0.2  
Less than 0.1  
24

---  
3.331  
---  
---  
0.799

### MILLIGRAMS PER LITER

Iron  
Fluoride  
P. alkalinity, in terms of  
calcium carbonate  
MO alkalinity, in terms of  
calcium carbonate  
Hardness, in terms of  
calcium carbonate  
Total dissolved solids  
(calculated)

0.23  
1.0  
---  
---  
---  
180  
585

Aluminum  
Copper  
Cadmium  
Lead  
Manganese  
Silver  
Zinc

Less than 0.1  
Less than 0.1  
Less than 0.01  
Less than 0.05  
Less than 0.05  
Less than 0.05  
Less than 0.5

Ammonia-nitrogen  
Lithium  
Barium  
Hexavalent chromium  
Arsenic

0.4  
Less than 0.5  
Less than 1  
Less than 0.01  
Less than 0.01

pH 7.7  
Specific conductance  
840 micromhos per cc

Selenium  
Boron  
Hydroxide

Less than 0.01  
2.8  
Less than 0.1

## MEMBERS OF:

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AMERICAN CHEMICAL SOCIETY  
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INSTITUTE OF FOOD TECHNOLOGY  
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II B-162

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul V. Ochs*  
CHEMIST

HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: January 2, 1975  
HRI Project No.  
HRI Series No.  
Samples received:

535  
7655  
Nov. 27, 1974

RECEIVED  
JAN 3 1975  
TOSCO/GOLDEN

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\text{pCi/l}$		$\text{Ra}$		$\text{pCi/l}$	
		Total	$\pm$	Precision*	Total	$\pm$	Precision*	226	$\pm$	226	Precision*
7655-1	Arco et al SG#10-1105	9.7	$\pm$	2.6	0	$\pm$	8	0.3	$\pm$	0.4	
-2 ✓	Base Mine Zone	4.3	$\pm$	5.5	0	$\pm$	25	0.1	$\pm$	0.4	
-3	Environmental Cb-1 11/18	3.4	$\pm$	2.6	0	$\pm$	11				
-4	Arco et al SG#8 Bottom of Mining zone @ 1013	0	$\pm$	1.6	0	$\pm$	7				
-5 ✓	Arco SG#1 Above Base "A" Grove @ 970	1.8	$\pm$	2.3	0	$\pm$	9				
-6	Environmental Cb-2 11/16	0.4	$\pm$	1.6	0	$\pm$	8				
-7	Top of Parachute @ 706	4.5	$\pm$	2.0	0	$\pm$	8	0.3	$\pm$	0.5	
-8	Arco et al SG#17, #7 DST 1015-1062	11	$\pm$	3	0	$\pm$	8	0	$\pm$	0.4	
-9	SG#1-613	1.3	$\pm$	1.5	0	$\pm$	8				
-10 ✓	Arco et al SG#17 DST	1.0	$\pm$	1.5	0	$\pm$	8				
-11	Depth 808 11/9	0.8	$\pm$	2.5	0	$\pm$	11				
-12	Environmental Cb-4 11/17	2.6	$\pm$	2.0	0	$\pm$	8				
	Arco et al SG#8 Depth 971										
	Top of Mining Zone 11/4										
	Arco SG#8 600 ft. 1600 ml 10/26										

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96g

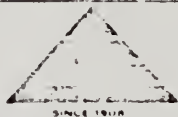
By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 80801 • AREA CODE 312 728-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401



Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: Environmental Cb<sub>1</sub> 11/18/74

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.05
Bismuth		Europium		Niobium		Scandium	<0.001
Lead	$\leq 0.008$	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	0.4	Chlorine	*
Gold		Cerium		Rubidium	0.01	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	0.09
Iridium		Barium	0.08	Selenium		Silicon	*
Osmium		Cesium	0.002	Arsenic	0.002	Aluminum	0.05
Rhenium		Iodine	0.002	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.04	Fluorine	*
Hafnium		Tin		Copper	0.09	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.009	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.01	Carbon	NR
Thulium		Silver		Iron	0.3	Boron	0.4
Erbium		Palladium		Manganese	0.2	Beryllium	
Holmium		Rhodium		Chromium	0.006	Lithium	0.3
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported  $< 0.002 \mu\text{g/ml}$  II B-164

\*Not reported upon request

Approved: .

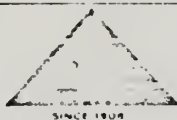


# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401



Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: Environmental Cb<sub>2</sub> 11/16/74

IAD No.: 97-183-002-12

CONCENTRATION IN µg/ml

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.04	Titanium	0.07
Bismuth	0.005	Europium		Niobium		Scandium	<0.001
Lead	0.02	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	0.7	Chlorine	*
Gold		Cerium		Rubidium	0.02	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	0.4
Iridium		Barium	0.04	Selenium		Silicon	*
Osmium		Cesium		Arsenic	0.02	Aluminum	MC
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.003	Sodium	*
Tantalum		Antimony		Zinc	0.4	Fluorine	*
Hafnium		Tin		Copper	3	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.002	Carbon	NR
Thulium		Silver		Iron	0.5	Boron	0.02
Erbium		Palladium		Manganese	0.1	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.03	Lithium	3
Dysprosium						Hydrogen	NR

NR - Not Reported

II B-165

All elements not reported <0.002 µg/ml

MC - Major component - element greater than 10 µg/ml

\*Not reported upon request

Approved:



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 728-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401



Date: 9 January 75

Analyst: S. Sweeney

P. O. No.:

Sample No.: Environmental Cb<sub>4</sub> 11/17/74

IAD No.: 97-183-002-12

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.001
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.08
Bismuth		Europium		Niobium		Scandium	0.002
Lead	$\leq 0.01$	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium		Rubidium	0.006	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	1
Iridium		Barium	0.02	Selenium		Silicon	*
Osmium		Cesium		Arsenic	0.01	Aluminum	MC
Rhenium		Iodine	0.004	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.003	Sodium	*
Tantalum		Antimony		Zinc	0.07	Fluorine	*
Hafnium		Tin		Copper	0.5	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.002	Carbon	NR
Thulium		Silver		Iron	0.3	Boron	0.03
Erbium		Palladium		Manganese	0.1	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.03	Lithium	0.3
Dysprosium						Hydrogen	NR

NR -- Not Reported

II B-166

All elements not reported <0.002  $\mu\text{g/ml}$

MC - Major component - element greater than 10  $\mu\text{g/ml}$

\*Not reported upon request

Approved:

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

9 January 75


Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-183-002-12

## Analytical Report

	TOC* mg/liter
✓ Environmental Cb-4 (11-17-74)	-1
✓ Environmental Cb-2 (11-16-74)	-1
✓ Environmental Cb-1 (11-18-74)	1
ARCO SG #1 above Base "A" grove @ 970'	-1
ARCO et al SG #1 @ 1105' Base mine Zone	-1
ARCO et al SG #17 #7 Dst. 1017'-1062'	-1
ARCO et al SG #8 Btm of mining zone @ 1013'	-1
Top of parachute cr @ 706	-1
ARCO et al SG #8 971-Top of mining zone (11-4-74)	-1
SG #1 @ 613'	-1
ARCO SG #8 600' 1600 mΩ 10-26-74	-1
ARCO et al #17 Dst Depth 808' (11-9-74)	6

\*Test performed on water make "Regular".  
Minus sign indicates less than reported value.

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-167



THE OIL SHALE CORPORATION

INTER OFFICE MEMORANDUM

LOS ANGELES  
DENVER  
GOLDEN X  
NEW YORK

LABORATORY DATA LETTER 75-11

FROM: F. C. Haas

DATE: January 14, 1975

TO: File

FILE NO.:

SUBJECT: Water Analyses of Samples  
from C-b Tract, Hole 1-C

Project 197

Four string samples were taken from aquifer test hole 1-C. Samples were labelled (1) 1C String #1 1550'-1640', (2) Well 1-C String 2 (no footage or date), (3) 1C #2 String, 1450-1480, 11/7/74, and (4) 1C #3 String, 60'-1250'.

Major constituent analyses were done by Industrial Laboratories Company, Denver, and TOSCO, Rocky Flats. Trace metals and total organic carbon were done by Commercial Testing & Engineering Co., Golden. Radioactivity was done by Hazen Research, Inc., Golden.

There are no large discrepancies in the major constituent analyses given in Table 1.

Total organic carbon in all samples was less than 10 mg/l, therefore, no additional organic analysis was done.

Gross alpha was 4 p Ci/l or less and gross beta was less than 100 p Ci/l in all samples. No further radiochemical analysis was done.

  
FCH/as

Enc.

  
\_\_\_\_\_  
Approved (MTA)

cc: Messrs. Vawter, Spence, Schulman, Barney, Cleveland,  
Schillinger, Legatski, Matis and Tait

TABLE 1

## MAJOR CONSTITUENT ANALYSES

## HOLE 1-C

Component	#1 String 1550'-1640'		#2 String		#2 String 1450'-1480'		#3 String 60'-1250'	
	Industrial		Industrial		Industrial	TOSCO	Industrial	TOSCO
Sodium, mg/l	520		330		220	232	255	221
Potassium, mg/l	NA		NA		NA	6.4	NA	3.6
Calcium, mg/l	3.7		41		37	28	27	15
Magnesium, mg/l	4.1		14		27	29	20	23
Sulfate, mg/l	96		450		230	347	240	226
Carbonate, mg/l	160		59		<0.1	7	<0.1	9
Bicarbonate, mg/l	780		305		465	423	480	452
Chloride, mg/l	36		21		3	9	<1	7
Fluoride, mg/l	10		3.6		8.8	4	9.2	6.4
ΣCations, meq/l	23.14		17.55		13.64	14.03	14.09	12.30
ΣAnions, meq/l	21.73		17.11		13.10	14.83	13.35	12.93
% Difference	3.1		1.3		2.0	2.8	2.7	2.5
Silica, mg/l	12		13		15	16	17	18
pH	9.0		8.9		7.9	8.5	7.8	8.6
Calculated TDS, mg/l	1224		1080		769	885	803	750

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 11/9/74  
DATE REPORTED: 12/19/74  
LAB. NUMBER: 4515

SAMPLE MARKED: <sup>String</sup> Cb at 1C Spring #1 1550-1640

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium	3.7		0.185
Magnesium	4.1		0.337
Sodium	520	$\Sigma$ Cations = 23.14	22.620
Carbonate	160	$\Sigma$ Anions = 21.73	5.395
Bicarbonate	780	% Diff. = 3.1	12.792

Chloride	36		1.015
Sulfate	96		1.997
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	12		0.400

Iron	0.2		---
Fluoride	10		0.526

P. alkalinity, in terms of calcium carbonate

---

### MILLIGRAMS PER LITER

MO alkalinity, in terms of calcium carbonate

---

Hardness, in terms of calcium carbonate

26

Total dissolved solids (calculated)

1,105

Aluminum	Less than 0.1
Copper	Less than 0.1
Cadmium	Less than 0.01
Lead	Less than 0.05
Manganese	Less than 0.05

Ammonia-nitrogen	0.12
Lithium	Less than 0.5
Barium	Less than 1.0
Hexavalent chromium	Less than 0.05
Arsenic	0.01

Silver	Less than 0.05
Zinc	Less than 0.5
Mercury	Less than 0.01

Selenium	Less than 0.01
Boron	1.1
Hydroxide	Less than 0.1

pH 9.0

Specific conductance  
1,420 micromhos per cc

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL FACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-170

THE INDUSTRIAL LABORATORIES COMPANY  
*H. Paul Wicks*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 11/1/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 4322

SAMPLE MARKED: Well 1-C String #2

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium	41		2.046
Magnesium	14		1.152
Sodium	330	$\Sigma$ Cations = 17.55	14.355
Carbonate	59	$\Sigma$ Anions = 17.11	1.965
Bicarbonate	305	% Diff. = 1.3	5.002

Chloride	21		0.592
Sulfate	450		9.360
Nitrate	1.0		---
Phosphate	Less than 0.1		---
Silicon dioxide	13		0.433

Iron	1.3		---
Fluoride	3.6		---

P. alkalinity, in terms of calcium carbonate	----		MILLIGRAMS PER LITER
--	------	--	----------------------

MO alkalinity, in terms of calcium carbonate			
--	--	--	--

Hardness, in terms of calcium carbonate			
---	--	--	--

Total dissolved solids (calculated)	160		
	1,080		

Lithium	Less than 0.5		
Kjeldahl nitrogen	0.6		
Ammonia-nitrogen	0.4		

Barium	Less than 1.0		
Hexavalent chromium	Less than 0.01		

Arsenic	Less than 0.01		
Selenium	Less than 0.01		
Boron	1.7		

Hydroxide	Less than 0.1
Aluminum	Less than 0.05

Copper	0.4
Cadmium	Less than 0.01
Lead	0.15 <del>1.5</del>

Manganese	0.44
Silver	Less than 0.01
Zinc	1.0 <del>10</del>
Mercury	Less than 0.01

pH	8.9
Specific conductance	1,420 micromhos per cc

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
SOCIETY OF ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
GMA XI

II B-171

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul Ochs*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

John Matis

DATE RECEIVED: 11/9/74  
DATE REPORTED: 12/19/74

LAB. NUMBER: 4516

SAMPLE MARKED: Cb at 1C #2 <sup>String</sup> Spring 1450-1480 11/7/74

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	37		1.846
Magnesium	27	$\Sigma$ Cations = 13.64	2.222
Sodium	220	$\Sigma$ Anions = 13.10	9.570
Carbonate	Less than 0.1	% Diff. = 2.0	---
Bicarbonate	465		7.626
Chloride	3		---
Sulfate	230		4.992
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	15		0.500
Iron	0.18		---
Fluoride	8.8		0.484
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	200	Aluminum	Less than 0.1
Total dissolved solids (calculated)	810	Copper	Less than 0.1
		Cadmium	Less than 0.01
		Lead	Less than 0.05
		Manganese	0.06
Ammonia-nitrogen	0.17	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1.0	Mercury	Less than 0.01
Hexavalent chromium	Less than 0.05		
Arsenic	0.01		
Selenium	Less than 0.01	pH	7.9
Boron	1.4	Specific conductance	1,350 micromhos per cc
Hydroxide	Less than 0.1		

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKING ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-172

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Vick*

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 11/9/74  
DATE REPORTED: 12/19/74

LAB. NUMBER: 4517

SAMPLE MARKED: Cb at 1C #3 <sup>String</sup> Spring 60 feet-1,250 feet

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	27		1.347
Magnesium	20		1.646
Sodium	255	$\Sigma$ Cations =	14.09
Carbonate	Less than 0.1	$\Sigma$ Anions =	13.35
Bicarbonate	480	% Diff. =	2.7
			7.872
Chloride	Less than 1		---
Sulfate	240		4.992
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	17		0.566
Iron	0.28		---
Fluoride	9.2		0.484
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	150	Aluminum	Less than 0.1
Total dissolved solids (calculated)	800	Copper	0.1
		Cadmium	Less than 0.01
		Lead	Less than 0.05
		Manganese	Less than 0.05
Ammonia-nitrogen	0.23	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1.0	Mercury	Less than 0.01
Hexavalent chromium	Less than 0.05		
Arsenic	0.02		
Selenium	Less than 0.01	pH	7.8
Boron	1.3	Specific conductance	1,200 micromhos per cc
Hydroxide	Less than 0.1		

MEMBERS OF:

AMERICAN ASS'N OF CERIAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BATTERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-173

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul V. Ch...*

CHEMIST

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

RECEIVED  
DEC 19 1974  
TOSCO/GOLDEN

16 December 74

Mr. Frank Haas  
The Oil Shale Corp.  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-163-002-18

## ANALYTICAL REPORT

	TOC * mg/liter	Nitrate mg/liter Interference
String #1 Sg-11 11-2-74	38	
Sg-19 11-1-74	<1	0.075
Sg-18 11-1-74	<1	0.073
✓ Arco c-b at 1C String #1-1550- 1640 Deepest	<1	0.15
✓ Arco c-b at 1C String #2-1450-1480	<1	0.085
✓ Arco c-b at 1C String #3-60'-1250'	<1	0.038

\*Test performed on samples marked "Regular"

*Charles R. Wilson*

Charles R. Wilson  
Analyst

*M. L. Jacobs*

Approved by:  
M. L. Jacobs, Ph.D.  
Divisional Manager

CRW/hb

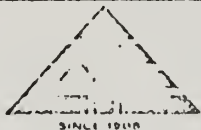
II B-174





# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 220 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-0434



Reply to

Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

20 November 74

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

Re: IAD #97-153-002-04

## ANALYTICAL REPORT

	TOC* mg/liter	Nitrates** mg/liter N
Aquifer Test #1 after pumping 15 hrs.	<1	0.34
✓ Well 1-C String #2	8	0.10
ARCO SG #18-A T.D. 1330'	<1	0.22
ARCO SG-9 2750'	<1	0.056

\*Test performed on samples marked "Regular" and  
run by an outside laboratory.

\*\*Test performed on samples marked "Hg for N"

*Charles R. Wilson*  
Charles R. Wilson  
Analyst

*M. L. Jacobs*  
Approved by:  
M. L. Jacobs Ph.D.  
Divisional Manager

CRW/hb

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NOV 25 1974

II B-175

WOSCO-GOLDEN



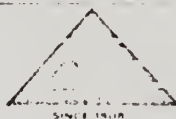


# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
TOSCO  
18200 West Hiway 72  
Golden, CO 80401



Date: 16 December 74

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO c-b at 1C String #1-1550-1640 Deepest IAD No.: 97-163-002-18  
Metal & Acid

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.003
Thorium		Gadolinium		Molybdenum	0.07	Titanium	0.08
Bismuth		Europium		Niobium		Scandium	0.002
Lead	0.02	Samarium		Zirconium	0.004	Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	** 0.0019	Praseodymium		Strontium	0.4	Chlorine	*
Gold		Cerium		Rubidium	0.1	Sulfur	*
Platinum		Lanthanum	0.007	Bromine	0.05	Phosphorus	1
Iridium		Barium	0.04	Selenium		Silicon	*
Osmium		Cesium	0.07	Arsenic	0.03	Aluminum	0.9
Rhenium		Iodine	0.006	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.002	Sodium	*
Tantalum		Antimony	0.03	Zinc	0.2	Fluorine	*
Hafnium		Tin	STD	Copper	0.1	Oxygen	NR
Lutetium		Indium		Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.006	Carbon	NR
Thulium		Silver		Iron	0.6	Boron	0.1
Erbium		Palladium		Manganese	0.06	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.003	Lithium	5
Dysprosium						Hydrogen	NR

NR - Not Reported

All elements not reported <0.003  $\mu\text{g/ml}$

\*Not reported upon request

\*\*Flameless atomic absorption

II B-176

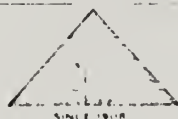
Approved:

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
TOSCO  
18200 West Hiway 72  
Golden, CO 80401



Date: 16 December 74

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO c-b at 1C String #2-1450-1480  
Metal & Acid

IAD No.: 97-163-002-18

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.1	Titanium	0.1
Bismuth		Europium		Niobium		Scandium	0.003
Lead	0.03	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	** 0.0009	Praseodymium		Strontium	5	Chlorine	*
Gold		Cerium		Rubidium	0.05	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	0.2
Iridium		Barium	0.1	Selenium		Silicon	*
Osmium		Cesium	0.02	Arsenic	0.05	Aluminum	0.5
Rhenium		Iodine	0.01	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.05	Fluorine	*
Hafnium		Tin		Copper	0.03	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.006	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.003	Carbon	NR
Thulium		Silver		Iron	0.5	Boron	0.2
Erbium		Palladium		Manganese	0.2	Beryllium	0.002
Holmium		Rhodium		Chromium	0.005	Lithium	4
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported  $<0.003 \mu\text{g/ml}$  II B-177

\*Not reported upon request

\*\*Flameless Atomic Absorption

Approved:

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST AVENUE, GOLDEN, COLORADO, 80401. PHONE: 303-278-9521

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401



Analyst: S. Sweeney

IAD No.: 97-153-002-04

 $\mu\text{g/ml}$ 

CONCENTRATION IN PERCENT WEIGHT

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.004
Thorium		Gadolinium		Molybdenum	0.09	Titanium	0.06
Bismuth		Europium		Niobium		Scandium	0.01
Lead	0.2	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	** 0.003	Praseodymium		Strontium	0.3	Chlorine	*
Gold		Cerium	0.003	Rubidium	0.02	Sulfur	*
Platinum		Lanthanum	0.01	Bromine	0.003	Phosphorus	0.05
Iridium		Barium	0.02	Selenium		Silicon	*
Osmium		Cesium		Arsenic	0.02	Aluminum	0.2
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.1	Fluorine	*
Hafnium		Tin		Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.01	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.005	Carbon	NR
Thulium		Silver		Iron	≈7	Boron	0.01
Erbium		Palladium		Manganese	0.2	Beryllium	<0.001
Holmium		Rhodium		Chromium	0.02	Lithium	0.6
Dysprosium						Hydrogen	NR

II B-178

NR – Not Reported       $<0.008 \mu\text{g/ml}$

All elements not reported  $\times 100$  ppm weight

\*Not reported upon request

\*\*Flameless Atomic Absorption

Approved:

\*\*\*Sample was filtered through a 0.45 m  
filter before running

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
TOSCO  
18200 West Hiway 72  
Golden, CO 80401

Date: 16 December 74

Analyst: S. Sweeney

P. O. No.:

Sample No.: ARCO c-b at 1C String #3-60'-1250'  
Metal & Acid

IAD No.: 97-163-002-18

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	<0.001
Thorium		Gadolinium		Molybdenum	0.02	Titanium	0.08
Bismuth		Europium		Niobium		Scandium	0.002
Lead	0.01	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	** 0.0008	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium		Rubidium	0.01	Sulfur	*
Platinum		Lanthanum	0.002	Bromine	0.02	Phosphorus	0.3
Iridium		Barium	0.02	Selenium		Silicon	*
Osmium		Cesium		Arsenic	0.06	Aluminum	0.9
Rhenium		Iodine	0.002	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.03	Fluorine	*
Hafnium		Tin		Copper	0.03	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.01	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.002	Carbon	NR
Thulium		Silver		Iron	0.6	Boron	0.1
Erbium		Palladium		Manganese	0.2	Beryllium	
Holmium		Rhodium		Chromium	0.006	Lithium	0.5
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported <0.002  $\mu\text{g/ml}$

\*Not reported upon request

\*\*Flameless Atomic Absorption

II B-179

Approved:



HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: December 20, 1974  
HRI Project No. 535  
HRI Series No. 7583  
Samples received: Nov. 8, 1974

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\text{pCi/l}$		$\beta$		$^{226}\text{Ra}$		Precision*
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	
7583-1 ✓	1-C string #1 1550-1640	4.0	$\pm$	4.1	$\pm$	2.1	$\pm$	10	$\pm$			
-2 ✓	1-C string #2 1450-1480	1.6	$\pm$	0	$\pm$	1.7	$\pm$	9	$\pm$			
-3 ✓	1-C string #3 60-1250	2.0	$\pm$	2	$\pm$	1.7	$\pm$	9	$\pm$			
-4	SG-11 11/2	43	$\pm$	390	$\pm$	40	$\pm$	170	$\pm$	27	$\pm$	5
-5	SG-18 11/1	3.6	$\pm$	0	$\pm$	2.3	$\pm$	11	$\pm$			
-6	SG-19 11/1	7.9	$\pm$	33	$\pm$	4.4	$\pm$	19	$\pm$	0.1	$\pm$	0.7

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

ljb



HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. F. C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: December 3, 1974  
HRI Project No. 535  
HRI Series No. 7559  
Samples received: November 1, 1974

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$ pCi/l		$\alpha$ Precision*		$\beta$ pCi/l		$\beta$ Precision*		$Ra^{226}$ pCi/l		Precision*	
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$
7559-1	Aquifer Test #1 Pumped 15 hrs.	4.2	$\pm$	2.3	$\pm$	0	$\pm$	11	$\pm$	0.3	$\pm$	0.5	$\pm$
-2	Well #1-C String #2	0.6	$\pm$	3.4	$\pm$	9	$\pm$	12	$\pm$		$\pm$		$\pm$
-3	SG-9 2750'	5.5	$\pm$	2.6	$\pm$	0	$\pm$	11	$\pm$	0	$\pm$	0.4	$\pm$
-4	SG-18-A TD 1380	8.0	$\pm$	3.3	$\pm$	0	$\pm$	11	$\pm$	0.1	$\pm$	0.4	$\pm$

II B-181

By: John C. Jarvis

John C. Jarvis  
Manager, Analytical Laboratory

1jb

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

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DEC 4 1974

THE OIL SHALE CORPORATION  
INTER OFFICE MEMORANDUM

NEW YORK ☐  
DENVER ☒  
LOS ANGELES ☐

LABORATORY DATA LETTER 75-28

FROM: F. C. Haas

DATE: February 14, 1975

TO: File

FILE NO.: 5100-3


SUBJECT: Analyses of Water Samples  
from C-b Tract, Core  
Hole SG-9 (String Nos. 1  
and 2)

Project No. 197

Two water samples were taken from Core Hole SG-9; one sample from String No. 1 and the other from String No. 2. The samples were analyzed for major and minor constituents, trace metals, radioactivity and total organic carbon. Major constituents were done by Industrial Laboratories, Denver, Colorado, and TOSCO, Rocky Flats. Minor constituents were done by Commercial Testing & Engineering, Golden, Colorado. Radioactivity was done by Hazen Research, Inc., Golden, Colorado. Results of the analyses are attached.

There are no major discrepancies in the major constituent analyses.

Total organic carbon in both samples was less than 10 mg/liter in all samples. Gross alpha in String No. 1 was greater than 4 pCi/l, therefore, Ra<sub>226</sub> was determined. No Ra<sub>226</sub> was found.

  
FCH/aw  
Encs.

  
Approved (MTA)

cc: R. G. Vawter  
H. M. Spence  
B. L. Schulman  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski (ARCO)  
J. R. Matis (ARCO)  
D. B. Tait (ARCO)

Table 1

## MAJOR CONSTITUENT ANALYSES

<u>Component</u>	<u>String No. 1</u>		<u>String No. 2</u>	
	<u>Industrial</u>	<u>TOSCO</u>	<u>Industrial</u>	<u>TOSCO</u>
Sodium, mg/l	400	414	310	271
Potassium, mg/l	NA	5.3	NA	4.8
Calcium, mg/l	19	NA	117	NA
Magnesium, mg/l	7.5	7.6	68	100
Sulfate, mg/l	51	67	375	431
Carbonate, mg/l	72	17	42	12
Bicarbonate, mg/l	860	972	690	739
Chloride, mg/l	44	28	60	49
Fluoride, mg/l	18	17	0.2	2.2
$\Sigma$ Cations, meq/l	18.97	—	24.92	—
$\Sigma$ Anions, meq/l	19.75	—	24.98	—
% Difference	2.0	—	<0.1	—
Silica, mg/l	15	13	22	20
pH	8.6	8.4	8.8	8.5
Conductivity, $\mu$ mhos/cm	1500	1400	1640	1650
Calculated TDS, mg/l	1048	—	1332	—

NA - Not Analyzed.

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 12/6/74  
DATE REPORTED: 12/20/74  
LAB. NUMBER: 5247

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: SG-9 String #1

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	19		0.948
Magnesium	7.5		0.617
Sodium	400	Σ Cations = 18.97	17.400
Carbonate	72	Σ Anions = 19.75	2.398
Bicarbonate	860	% Difference = 2.0	14.104
Chloride	44		1.241
Sulfate	51		1.061
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	15		0.500
Iron	0.68		---
Fluoride	18		0.947
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	78	Aluminum	Less than 0.1
Total dissolved solids (calculated)	1,060	Copper	Less than 0.1
		Cadmium	Less than 0.01
		Lead	0.24
		Manganese	Less than 0.05
Ammonia-nitrogen	0.1	Silver	Less than 0.05
Lithium	Less than 0.5	Zinc	Less than 0.5
Barium	Less than 1	Mercury	Less than 0.01
Hexavalent chromium	Less than 0.01		
Arsenic	Less than 0.01	pH	8.6
Selenium	Less than 0.01	Specific conductance	1,500 micromhos. per cc
Boron	4.9		
Hydroxide	Less than 0.1		

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-184

THE INDUSTRIAL LABORATORIES COMPANY

*J. Frank Welch*

CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

John Matis

DATE RECEIVED: 12/6/74  
DATE REPORTED: 12/20/74

LAB. NUMBER: 5248

SAMPLE MARKED: SG 9 - String #2

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium	117	5.838
Magnesium	68	5.596
Sodium	310	13.485
Carbonate	42	1.399
Bicarbonate	690	11.316

$\Sigma$  Cations = 24.92

$\Sigma$  Anions = 24.98

% Difference = <0.1

Chloride	60	1.692
Sulfate	375	10.575
Nitrate	0.4	---
Phosphate	Less than 0.1	---
Silicon dioxide	22	---

Iron	0.18
Fluoride	2

### MILLIGRAMS PER LITER

P. alkalinity, in terms of calcium carbonate	---	Aluminum	Less than 0.1
MO alkalinity, in terms of calcium carbonate	---	Copper	Less than 0.1
		Cadmium	Less than 0.01
		Lead	Less than 0.05

Hardness, in terms of calcium carbonate	570	Manganese	0.15
---	-----	-----------	------

Total dissolved solids (calculated)	1,330	Silver	Less than 0.05
		Zinc	Less than 0.5
		Mercury	Less than 0.01

Ammonia-nitrogen	0.2
Lithium	Less than 0.5
Barium	Less than 1
Hexavalent chromium	Less than 0.01
Arsenic	Less than 0.01

Selenium	Less than 0.01
Boron	1.5
Hydroxide	Less than 0.1

pH 8.8  
Specific conductance  
1,640 micromhos per cc

MEMBER OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL RACING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-185

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul*  
CHEMIST



# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-8434

INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colorado 80401



Date: 13 February 75

Analyst: S. Sweeney

P. O. No.: CORRECTED COPY

Sample No.: Environmental Sg #9 - String 1

IAD No.: 97-190-002-03

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.002
Thorium		Gadolinium		Molybdenum	0.07	Titanium	0.1
Bismuth		Europium		Niobium		Scandium	0.002
Lead	0.01	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	2	Chlorine	*
Gold		Cerium	0.002	Rubidium	0.05	Sulfur	*
Platinum		Lanthanum	0.001	Bromine	0.03	Phosphorus	0.3
Iridium		Barium	0.08	Selenium	0.005	Silicon	*
Osmium		Cesium	0.01	Arsenic	0.02	Aluminum	0.4
Rhenium		Iodine	0.01	Germanium		Magnesium	*
Tungsten	0.01	Tellurium		Gallium	0.003	Sodium	*
Tantalum		Antimony	0.009	Zinc	1	Fluorine	*
Hafnium		Tin		Copper	0.03	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.003	Nitrogen	NR
Ytterbium		Cadmium	0.1	Cobalt	0.002	Carbon	NR
Thulium		Silver	0.009	Iron	2	Boron	1
Erbium		Palladium		Manganese	0.09	Beryllium	0.001
Holmium		Rhodium		Chromium	0.006	Lithium	0.22**
Dysprosium						Hydrogen	NR

\* Not reported upon request  
\*\* Atomic Absorption

NR - Not Reported

All elements not reported  $< 0.002 \mu\text{g/ml}$

II B-186

Approved:

*M. Sweeney*

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frnak Haas  
The Oil Shele Corporation  
18200 West Hiway 72  
Golden, Colorado 80401



Date: 13 February 75

Analyst: S. Sweeney

P. O. No.: CORRECTED COPY

Sample No.: Environmental Sg #9 - String #2

IAD No.: 97-190-002-03

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.004
Thorium		Gadolinium		Molybdenum	0.08	Titanium	0.05
Bismuth		Europium		Niobium		Scandium	0.009
Lead	$\leq 0.02$	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	NR	Praseodymium		Strontium	3	Chlorine	*
Gold		Cerium		Rubidium	0.02	Sulfur	*
Platinum		Lanthanum		Bromine	0.03	Phosphorus	0.2
Iridium		Barium	0.07	Selenium	0.009	Silicon	*
Osmium		Cesium	0.005	Arsenic	0.009	Aluminum	0.7
Rhenium		Iodine	0.005	Germanium		Magnesium	*
Tungsten	0.01	Tellurium		Gallium		Sodium	*
Tantalum		Antimony	0.006	Zinc	0.1	Fluorine	*
Hafnium		Tin		Copper	0.03	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.02	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.01	Carbon	NR
Thulium		Silver		Iron	0.5	Boron	1
Erbium		Palladium		Manganese	0.4	Beryllium	0.003
Holmium		Rhodium		Chromium	0.01	Lithium	0.27**
Dysprosium						Hydrogen	NR

\* Not reported upon request  
\*\* Atomic Absorption

NR - Not Reported

All elements not reported  $< 0.004 \mu\text{g/ml}$

II B-187

Approved:

**COMMERCIAL TESTING & ENGINEERING CO.**

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

10 January 75

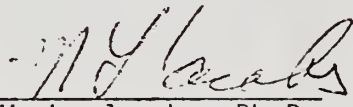
Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-190-002-03

Analytical Report

	TOC* mg/Liter
✓ Environmental Sg #9 - String #1	<1
✓ Environmental Sg #9 - String #2	8
ARCO etal Sg #17 - Dst #8 1066-1116.7	2

\*Test performed on water marked "Regular".  
Outside laboratory

  
M. L. Jacobs, Ph.D.  
Divisional Manager

MLJ/hb

II B-188



HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: February 6, 1975  
HRI Project No. 535  
HRI Series No. 7726  
Samples received: Dec. 16, 1974

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\beta$		$\beta$		Precision*
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	
7726-1	SG#17 DST#8	1.7	$\pm$	1.9	$\pm$	15	$\pm$	10	$\pm$	
-2 ✓	1066-1116.7	4.5	$\pm$	2.8	$\pm$	0	$\pm$	10	$\pm$	1.1
-3 ✓	SG-9 String #1	2.3	$\pm$	2.6	$\pm$	2	$\pm$	11	$\pm$	
	SG-9 String #2									

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

RECEIVED

FEB 9 1975

TOSCO/GOLDEN

1jb

By: *John C. Jarvis*  
John C. Jarvis  
Manager, Analytical Laboratory

# THE OIL SHALE CORPORATION

## INTER OFFICE MEMORANDUM

NEW YORK ☐  
DENVER ☒  
LOS ANGELES ☐

LABORATORY DATA LETTER 75-41

FROM: F. C. Haas

DATE: March 3, 1975

TO: File

FILE NO.: 5100-3

SUBJECT: Analysis of Water Sample  
from Core Hole SG-11,  
String No. 1

Project No. 197

Attached are the analyses of a water sample from  
Core Hole SG-11, String No. 1.

Major constituent analyses were done by Industrial  
Laboratories, Denver, Colorado, and TOSCO, Rocky Flats.  
Minor constituents were done by Industrial Laboratories.  
Trace metals and total organic carbon were done by Commercial  
Testing & Engineering, Golden, Colorado. Radioactivity was  
done by Hazen Research, Inc., Golden, Colorado.

This water is similar in composition as the water from  
SG-17, DST-34, 2120-2170 feet. However, it does not con-  
tain the high nitrate or ammonia nitrogen.

Industrial Laboratories reported 0.8 mg/l boron (colori-  
metric), whereas Commercial Testing & Engineering reported  
greater or equal to 120 mg/l boron (spark source mass spec-  
troscopy). TOSCO then set up a colorimetric procedure and  
found 315 mg/l boron. There are also discrepancies in the  
fluoride, lithium and barium analyses. Industrial Laboratories  
report 18 mg/l fluoride, whereas TOSCO found 48 mg/l. Industrial  
Laboratories reports <0.5 mg/l lithium, whereas Commercial  
Testing & Engineering reports  $\geq 70$  mg/l and TOSCO found 79 mg/l  
lithium. Industrial Laboratories found no barium, whereas  
Commercial Testing & Engineering found 5 mg/l. Industrial  
Laboratories has been advised of this and have checked it out  
(later samples show much better agreement, except for the  
boron).


The sample from String No. 1 contained 38 mg/l total  
organic carbon. A chloroform extraction removed 29 mg/l of  
organic material. Of this amount, organic bases were 0.6 mg/l,

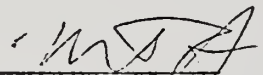


Memo from FCH to File  
March 3, 1975  
Page 2

neutral compounds were 11.8 mg/l, phenolics were 5.0 mg/l and acidic compounds were 7.3 mg/l. The acidic material contained 2.93 percent sulfur. (Acidic material from shale oil contains 3.68 percent sulfur.) There was insufficient material to do a nitrogen on the organic bases. An extraction for polycyclic aromatics showed less than 1.3 mg/l.

Gross alpha was 43 pCi/l; Ra<sub>226</sub> was determined and found to be 27 pCi/l, which is well above Colorado drinking water standards. Gross beta was 390 pCi/l; analyses for U<sub>Nat.</sub> and Th<sub>230</sub> showed these elements to be absent.

  
FCH/aw  
Encs.

  
Approved (MTA)

cc: R. G. Vawter  
B. L. Schulman  
H. M. Spence  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski (ARCO)  
J. R. Matis (ARCO) ✓  
D. B. Tait (ARCO)

Table 1

ANALYSES OF STRING NO. 1, SG-11

<u>Component</u>	<u>Laboratories</u>		
	<u>Industrial</u>	<u>TOSCO</u>	<u>CT &amp; E</u>
Sodium, mg/l	15,300	16,367	
Potassium, mg/l	NA	125	
Calcium, mg/l	<0.1	6	
Magnesium, mg/l	12	14	
Sulfate, mg/l	<4	2	
Carbonate, mg/l	1,320	1,962	
Bicarbonate, mg/l	25,900	21,594	
Chloride, mg/l	6,930	8,154	
Fluoride, mg/l	18	48	
Lithium, mg/l	<0.5	79	≥ 70
Borate, mg/l	0.8	1,230	≥ 120 (B)
Barium, mg/l	<1	NA	5
ΣCations, meq/l	667	727	
ΣAnions, meq/l	665	680	
% Difference	0.2	3.3	
Silica, mg/l	18	24	
pH	8.4	8.8	
Calculated TDS, mg/l	36,289	38,592	
Conductivity, micromhos/cm	40,000	40,000	

NA - Not Analyzed.

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/9/74  
DATE REPORTED: 12/19/74  
LAB. NUMBER: 4518

SAMPLE MARKED: SG-11 11/2 String #1

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium	Less than 0.1	---
Magnesium	12	0.988
Sodium	15,300	$\Sigma$ Cations = 666.5
Carbonate	1,320	$\Sigma$ Anions = 664.5
Bicarbonate	25,900	% Difference = 0.2

Chloride	6,930	195.426
Sulfate	Less than 4	---
Nitrate	Less than 0.1	---
Phosphate	Less than 0.1	---
Silicon dioxide	18	0.599

Iron	2.3	---
Fluoride	18	0.316

P. alkalinity, in terms of  
calcium carbonate

MO alkalinity, in terms of

calcium carbonate

Hardness, in terms of

calcium carbonate

Total dissolved solids

(calculated)

48  
31,960

### MILLIGRAMS PER LITER

Aluminum	Less than 0.1
Copper	Less than 0.1
Cadmium	Less than 0.01
Lead	Less than 0.05
Manganese	Less than 0.05

Ammonia	Not preserved
Lithium	Less than 0.5
Barium	Less than 1.0
Hexavalent chromium	Less than 0.05
Arsenic	Less than 0.01

Silver	Less than 0.05
Zinc	Less than 0.5
Mercury	Less than 0.01

Selenium	Less than 0.01
Boron	0.8
Hydroxide	Less than 0.1

pH 8.4  
Specific conductance  
40,000 micromhos per cc

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL AGRICULTURAL CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-193

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul DeLo*  
CHEMIST

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
TOSCO  
18200 West Hiway 72  
Golden, CO 80401

Date: 16 December 74

Analyst: S. Sweeney

P. O. No.:

Sample No.: String #1 Sg-11 11-2-74  
Metal & Acid

IAD No.: 97-163-002-18

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.02
Thorium		Gadolinium		Molybdenum	0.01	Titanium	0.2
Bismuth		Europium		Niobium	0.01	Scandium	0.01
Lead	0.03	Samarium		Zirconium	0.9	Calcium	*
Thallium		Neodymium		Yttrium	0.03	Potassium	*
Mercury	** 0.0026	Praseodymium		Strontium	3	Chlorine	*
Gold		Cerium		Rubidium	0.04	Sulfur	*
Platinum		Lanthanum	0.02	Bromine	0.8	Phosphorus	0.4
Iridium		Barium	5	Selenium		Silicon	*
Osmium		Cesium	0.04	Arsenic	0.03	Aluminum	0.4
Rhenium		Iodine	0.5	Germanium	0.05	Magnesium	*
Tungsten		Tellurium		Gallium	0.02	Sodium	*
Tantalum		Antimony	0.008	Zinc	0.03	Fluorine	*
Hafnium		Tin		Copper	0.2	Oxygen	NR
Lutetium		Indium	STD	Nickel	***	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.03	Carbon	NR
Thulium		Silver		Iron	3	Boron	$\geq 120$
Erbium		Palladium		Manganese	0.07	Beryllium	0.002
Holmium		Rhodium		Chromium	0.007	Lithium	$\geq 70$
Dysprosium						Hydrogen	NR

NR - Not Reported

All elements not reported  $< 0.006 \mu\text{g/ml}$

\*Not reported upon request

\*\*Flameless Atomic Absorption

II B-194

Approved:



\*\*\*Interference from NaCl molecules

## COMMERCIAL TESTING &amp; ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

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DEC 19 '74

16 December 74

TOSCO/GOLDEN

Mr. Frank Haas  
The Oil Shale Corp.  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-163-002-18

ANALYTICAL REPORT

	TOC *	Nitrate
	mg/liter	mg/liter
✓ String #1 Sg-11 11-2-74	38	Interference
Sg-19 11-1-74	<1	0.075
Sg-18 11-1-74	<1	0.073
Arco c-b at 1C String #1-1550- 1640 Deepest	<1	0.15
Arco c-b at 1C String #2-1450-1480	<1	0.085
Arco c-b at 1C String #3-60'-1250'	<1	0.038

\*Test performed on samples marked "Regular"

*Charles R. Wilson*  
Charles R. Wilson  
Analyst

*M. L. Jacobs*  
Approved by:  
M. L. Jacobs, Ph.D.  
Divisional Manager

CRW/hb

II B-195





HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: December 20, 1974  
HRI Project No. 535  
HRI Series No. 7583  
Samples received: Nov. 8, 1974

REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\text{pCi/l}$		$\text{pCi/l}$		$\text{Ra}^{226} \pm$		Precision*
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	
7583-1	1-C string #1 1550-1640	4.0	$\pm$	41	$\pm$	2.1	$\pm$	10	$\pm$			
-2	1-C string #2 1450-1480	1.6	$\pm$	0	$\pm$	1.7	$\pm$	9	$\pm$			
-3	1-C string #3 60-1250	2.0	$\pm$	2	$\pm$	1.7	$\pm$	9	$\pm$			
-4	SG-11 11/2 String #1	43	$\pm$	390	$\pm$	40	$\pm$	170	$\pm$	27	$\pm$	5
-5	SG-18 11/1	3.6	$\pm$	0	$\pm$	2.3	$\pm$	11	$\pm$			
-6	SG-19 11/1	7.9	$\pm$	33	$\pm$	4.4	$\pm$	19	$\pm$	0.1	$\pm$	0.7

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

# HAZEN RESEARCH, INC.

## REPORT OF ANALYSIS

4601 INDIANA STREET  
GOLDEN, COLORADO • 80401  
TELEPHONE 303/279-4501

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: January 16, 1975

HRI Project No. 535  
HRI Series No. 7583  
Samples Rec'd Nov. 8, 1974

Analysis No.	Sample Designation	Th <sup>230</sup>	pCi/l		μCi/ml** U
			±	Precision*	
7583-4	SG-11 11/2	0	±	7.6	<10 x 10 <sup>-10</sup>

By:

*John C. Jarvis*  
John C. Jarvis  
Manager, Analytical Laboratory

ljb

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96σ

\*\*Uranium results reported assuming the activity of natural U = 6.77 x 10<sup>-7</sup> Ci/gm.

# THE OIL SHALE CORPORATION

## INTER OFFICE MEMORANDUM

NEW YORK [ ]  
DENVER [X]  
LOS ANGELES [ ]

LABORATORY DATA LETTER 75-10

FROM: F. C. Haas

DATE: January 13, 1975

TO: File

FILE NO.: 5100-3

SUBJECT: Analysis of Water Sample  
From C-b Tract, Core  
Hole SG-19

Project No. 197

At the request of J. R. Matis, one of the water samples from SG-19, which had previously been analyzed for major constituents was analyzed for trace metals, total organic carbon and radioactivity. The sample was labeled D. B. Tait, J.G.G., 11-1-74 (see Laboratory Data Letter 74-141). Results of the analysis are attached. Total organic carbon was less than 1 mg/l. Gross beta was less than 100 pCi/l. Gross alpha was greater than 4 pCi/l, therefore, Ra<sub>226</sub> was determined, but was found to be less than 4 pCi/l. These values would be acceptable in drinking water.

There is a typographical error in Laboratory Data Letter 74-141. The bicarbonate value in the above mentioned sample should be 1773 mg/l instead of 1173 mg/l.

This Laboratory Data Letter should be filed with Laboratory Data Letter 74-141.

*FCH*

FCH/aw

Encs.

*Matis*

Approved (MTA)

cc: R. G. Vawter  
B. L. Schulman  
J. H. Barney  
H. M. Spence  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski (ARCO)  
G. E. Davis (ARCO)  
D. B. Tait (ARCO)  
J. R. Matis (ARCO)

II B-198

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 11/9/74  
DATE REPORTED: 12/19/74

LAB. NUMBER: 4520

SAMPLE MARKED: SG-19 11/1

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	6.6		0.329
Magnesium	2.9		0.239
Sodium	755		32.843
Carbonate	66		0.300
Bicarbonate	1,780	$\Sigma$ Cations = 33.41	31.160
		$\Sigma$ Anions = 31.76	
		% Difference = 2.5	
Chloride	10		0.282
Sulfate	Less than 4		---
Nitrate	Less than 0.1		---
Phosphate	Less than 0.1		---
Silicon dioxide	9		0.300
Iron	Less than 0.05		---
Fluoride	3.1		
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	29	Aluminum	0.3
Total dissolved solids (calculated)	1,810	Copper	Less than 0.1
		Cadmium	Less than 0.01
		Lead	Less than 0.05
		Manganese	Less than 0.05
		Silver	Less than 0.05
Ammonia-nitrogen	0.14	Mercury	Less than 0.01
Lithium	Less than 0.5	Zinc	Less than 0.05
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.05		
Arsenic	Less than 0.01	pH	8.4
		Specific conductance	2,750 micromhos per cc
Selenium	Less than 0.01		
Boron	2.0		
Hydroxide	Less than 0.1		

MEMBERS OF:

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL AGENCIES CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-199

THE INDUSTRIAL LABORATORIES COMPANY

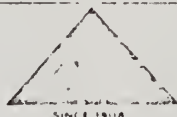
*H. Paul C. Paul*  
CHEMIST

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST 44TH AVENUE, GOLDEN, COLORADO 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
TOSCO  
18200 West Hiway 72  
Golden, CO 80401



Date: 16 December 74

Analyst: S. Sweeney

P. O. No.:

Sample No.: Sg #19 11-1-74  
Metal & Acid

IAD No.: 97-163-002-18

CONCENTRATION IN  $\mu\text{g/ml}$

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	$\leq 0.001$
Thorium		Gadolinium		Molybdenum	0.003	Titanium	0.03
Bismuth		Europium		Niobium		Scandium	0.001
Lead	$\leq 0.008$	Samarium		Zirconium	0.002	Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	** 0.0019	Praseodymium		Strontium	0.4	Chlorine	*
Gold		Cerium		Rubidium	0.005	Sulfur	*
Platinum		Lanthanum		Bromine	0.01	Phosphorus	0.06
Iridium		Barium	0.2	Selenium		Silicon	*
Osmium		Cesium	0.001	Arsenic	$\leq 0.001$	Aluminum	***0.7
Rhenium		Iodine	0.004	Germanium		Magnesium	*
Tungsten		Tellurium		Gallium	0.002	Sodium	*
Tantalum		Antimony		Zinc	0.05	Fluorine	*
Hafnium		Tin		Copper	0.08	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.002	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	$< 0.001$	Carbon	NR
Thulium		Silver		Iron	0.05	Boron	***0.7
Erbium		Palladium		Manganese	0.002	Beryllium	
Holmium		Rhodium		Chromium	0.002	Lithium	0.8
Dysprosium						Hydrogen	NR

NR — Not Reported

All elements not reported  $< 0.002 \mu\text{g/ml}$

\*Not reported upon request

\*\*Flameless Atomic Absorption

II B-200

Approved:

\*\*\*Heterogeneous



## COMMERCIAL TESTING &amp; ENGINEERING CO.

GENERAL OFFICES: 220 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 720-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

RECEIVED  
DEC 19 1974  
TOSCO/GOLDEN

16 December 74

Mr. Frank Haas  
The Oil Shale Corp.  
18200 West Hiway 72  
Golden, CO 80401

RE: IAD #97-163-002-18

ANALYTICAL REPORT

	TOC * mg/liter	Nitrate mg/liter Interference
String #1 Sg-11 11-2-74	38	
✓ Sg-19 11-1-74	<1	0.075
Sg-18 11-1-74	<1	0.073
Arco c-b at 1C String #1-1550- 1640 Deepest	<1	0.15
Arco c-b at 1C String #2-1450-1480	<1	0.085
Arco c-b at 1C String #3-60'-1250'	<1	0.038

\*Test performed on samples marked "Regular"

*Charles R. Wilson*  
Charles R. Wilson  
Analyst

*M. L. Jacobs*  
Approved by:  
M. L. Jacobs, Ph.D.  
Divisional Manager

CRW/hb

II B-201



HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. Frank C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: December 20, 1974  
HRI Project No. 535  
HRI Series No. 7583  
Samples received: Nov. 8, 1974

REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$		$\beta$		$\text{pCi/l}$		$\beta$		$^{226}\text{Ra}$	
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$
7583-1	1-C string #1 1550-1640	4.0	$\pm$	41	$\pm$	2.1	$\pm$	10	$\pm$		
-2	1-C string #2 1450-1480	1.6	$\pm$	0	$\pm$	1.7	$\pm$	9	$\pm$		
-3	1-C string #3 60-1250	2.0	$\pm$	2	$\pm$	1.7	$\pm$	9	$\pm$		
-4	SG-11 11/2	43	$\pm$	390	$\pm$	40	$\pm$	170	$\pm$	27	$\pm$
-5	SG-18 11/1	3.6	$\pm$	0	$\pm$	2.3	$\pm$	11	$\pm$	5	
-6 ✓	SG-19 11/1	7.9	$\pm$	33	$\pm$	4.4	$\pm$	19	$\pm$	0.1	$\pm$

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory





## II B-6 WATER QUALITY ANALYSES AQUIFER PUMP TESTS

Table II B-6.1 lists results of the analyses of three samples from the aquifer pump test well, AT-1. The first sample was collected at the end of a 4-hour pumping period on September 15, 1974 when the generator, transformers and pump were installed and tested. The second sample was collected after a preliminary pumping test of 15 hours. The third sample was taken after 23 days of pumping.

Major constituent analyses were done by Industrial Laboratories, Denver, Colorado; trace metals and total organic carbon by Commercial Testing & Engineering, Golden, Colorado; and radioactivity by Hazen Research, Inc., Golden, Colorado.

Total organic carbon was less than 1 mg/l. Gross beta was less than 100 pC/l. Gross alpha was greater than 4 pC/l; therefore, Ra226 was determined and was found to be less than 4 pC/l.

The major change observed during the testing was in the sulfate content, which changed markedly from well over 200 mg/l initially, to less than 4 mg/l on into the test. This probably reflects the initial contribution of high sulfate water from the Evacuation Creek Member versus the low sulfate-high bicarbonate water from the Parachute Creek Member. A logical hypothesis would be that as water levels in the pumping well dropped, fractures in the Evacuation Creek Member were depleted and the sulfate content was diminished. Another change observed during the testing was in the fluoride content, which increased as testing progressed from initial levels of 2-4 mg/l to about 18 mg/l. Perhaps this reflects early dilution by very low fluoride content water in the uppermost level of the aquifer which was depleted as pumping continued and water levels dropped.



TABLE II B-6.1WATER QUALITY ANALYSIS  
AQUIFER PUMP TESTSWell Number: AT-1

Date	9/15/74	10/22/74	12/23/74		
Element Measured		(15 hours)			
1. Aluminum (ug/l)		.04			
2. Ammonia (mg/l)		0.8			
3. Arsenic (ug/l)		.02			
4. Barium (ug/l)		.01			
5. Beryllium (ug/l)					
6. Bicarbonate (mg/l)	435	420	570		
7. Bismuth (ug/l)		<.005			
8. Boron (ug/l)		0.7	1.5		
9. Cadmium (ug/l)		<.005			
10. Calcium (mg/l)	40	61	16		
11. Carbonate (mg/l)		24	<.1		
12. Cerium (mg/l)		<.005			
13. Chloride (mg/l)	3	7	7		
14. Chrome, Hexavalent		<.01			
15. Cobalt (ug/l)		.001			
16. Conductivity, Specific (uS)	1050	990			
17. Copper (ug/l)		.02			
18. Fluoride (mg/l)	2.7	4.8	18		
19. Gallium (ug/l)		<.005			
20. Hardness, Total		180			
21. Hydroxide (mg/l)		<.1			
22. Iron (ug/l)		4			
23. Lead (ug/l)		.01			
24. Lithium (ug/l)		.08			
25. Magnesium (mg/l)	34	7.9	9.5		
26. Manganese (ug/l)		.01			
27. Mercury (ug/l)		.0085			
28. Molybdenum (ug/l)		.005			
29. Nickel (ug/l)		.01			
30. Nitrate (mg/l)		1.0			
31. pH	8.2	8.4			
32. Phosphate, Total		<.1			
33. Potassium (mg/l)			<1		
34. Selenium (ug/l)		<.005			
35. Silica (mg/l)	19	18			
(*) 36. Silver (ug/l)		<.005			
37. Sodium (ug/l)	194	210	200		
38. Solids, Dissolved (mg/l)	767	740	560		
39. Strontium (ug/l)		1			
40. Sulfate (mg/l)	261	210	<4		
41. Titanium (ug/l)		.1			
42. Vanadium (ug/l)		.001			
43. Yttrium (mg/l)		<.005			
44. Zinc (ug/l)		<.5			
45. Zirconium (mg/l)		<.005			
46. Radioactivity					
Gross Alpha (pCi)		4.2			
Radium 226**		.3			
Gross Beta (pCi)		0			
Thorium 230**					
Uranium**					
47. Total Organic Carbon (TOC)					
If TOC > 10 mg/l then measure					
Dissolved Organic Carbon		<1			
Suspended Organic Carbon					
Phenols					
Sulfur, Acid Extract					
Nitrogen, Base Extract					

(\*) Not required

\* Required if gross alpha is greater than 4 picocuries per liter (pCi).

\*\* Required if gross beta is greater than 100 picocuries per liter (pCi).

THE OIL SHALE CORPORATION

INTER OFFICE MEMORANDUM

NEW YORK ☐  
DENVER ☒  
LOS ANGELES ☐

LABORATORY DATA LETTER 75-12

FROM: F. C. Haas

DATE: January 15, 1975

TO: File

FILE NO.: 5100--3

SUBJECT: Analysis of Water Sample  
from Aquifer Test No. 1  
After Pumping Fifteen Hours

Project No. 197

Attached are results of the water analysis of a sample taken from the Aquifer Test No. 1 after pumping for 15 hours. Major constituent analyses were done by Industrial Laboratories, Denver, Colorado; trace metals and total organic carbon by Commercial Testing & Engineering, Golden, Colorado, and radioactivity by Hazen Research, Inc., Golden, Colorado.

Total organic carbon was less than 1 mg/l. Gross beta was less than 100 pCi/l. Gross alpha was greater than 4 pCi/l, therefore, Ra<sub>226</sub> was determined, but was found to be less than 4 pCi/l. These values are below drinking water standards.

*FCH*  
FCH/aw  
Encs.

*MTA*  
Approved (MTA)

cc: B. L. Schulman  
J. H. Bamey  
R. G. Vawter  
H. M. Spence  
T. H. Cleveland  
A. W. Schillinger  
M. W. Legatski (ARCO)  
J. R. Matis (ARCO)  
D. B. Tait (ARCO)

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/1/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 4321

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: #1 Test - 15 Hours Test

## ANALYSIS:

	MILLIGRAMS PER LITER		MILLI-EQUIVALENTS
Calcium	61		3.044
Magnesium	7.9		0.650
Sodium	210		9.135
Carbonate	24	$\Sigma$ Cations = 12.83	0.799
Bicarbonate	420	$\Sigma$ Anions = 12.38	6.888
		% Difference = 1.8	
Chloride	7		0.197
Sulfate	210		4.368
Nitrate	1.0		---
Phosphate	Less than 0.1		---
Silicon dioxide	18		0.599
Iron	Less than 0.05		---
Fluoride	4.8		0.126
P. alkalinity, in terms of calcium carbonate	---		
MO alkalinity, in terms of calcium carbonate	---		
Hardness, in terms of calcium carbonate	180	Aluminum	Less than 0.1
Total dissolved solids (calculated)	740	Copper	Less than 0.1
		Cadmium	Less than 0.01
		Lead	0.12
		Manganese	Less than 0.05
Kjeldahl nitrogen	1.1	Silver	Less than 0.01
Ammonia-nitrogen	0.8	Zinc	Less than 0.5
Lithium	Less than 0.05	Mercury	Less than 0.01
Barium	Less than 1.0		
Hexavalent chromium	Less than 0.01	pH	8.4
		Specific conductance	990 micromhos per cc
Arsenic	Less than 0.01		
Selenium	Less than 0.01		
Boron	0.7		
Hydroxide	Less than 0.1		

MEMBERS OF:

THE INDUSTRIAL LABORATORIES COMPANY

AMERICAN ASS'N OF CEREAL CHEMISTS  
AMERICAN CHEMICAL SOCIETY  
AMERICAN OIL CHEMISTS' SOCIETY  
ASS'N OF OFFICIAL BAKING CHEMISTS  
BAKERY ENGINEERS OF AMERICA  
INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

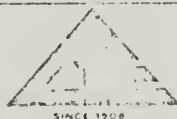
*H. Paul Matis*

# COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434  
INSTRUMENTAL ANALYSIS DIVISION, 14335 WEST AVENUE, GOLDEN, COLORADO, 80401, PHONE: 303-278-9521

Reply to

To: Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, Colo. 80401



Date: 20 November 74

Analyst: S. Sweeney

P. O. No.:

Sample No.: Aquifer Test #1 after pumping 15 hrs JAD No.: 97-153-002-04

CONCENTRATION IN  $\mu\text{g/ml}$  ~~XXXXXX~~

ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.	ELEMENT	CONC.
Uranium		Terbium		Ruthenium		Vanadium	0.001
Thorium		Gadolinium		Molybdenum	0.005	Titanium	0.1
Bismuth		Europium		Niobium		Scandium	<0.001
Lead	0.01	Samarium		Zirconium		Calcium	*
Thallium		Neodymium		Yttrium		Potassium	*
Mercury	**0.0085	Praseodymium		Strontium	1	Chlorine	*
Gold		Cerium		Rubidium	0.002	Sulfur	*
Platinum		Lanthanum		Bromine	0.003	Phosphorus	0.2
Iridium		Barium	0.01	Selenium		Silicon	*
Osmium		Cesium		Arsenic	0.02	Aluminum	0.04
Rhenium		Iodine		Germanium		Magnesium	*
Tungsten		Tellurium		Gallium		Sodium	*
Tantalum		Antimony		Zinc	0.05	Fluorine	*
Hafnium		Tin		Copper	0.02	Oxygen	NR
Lutetium		Indium	STD	Nickel	0.01	Nitrogen	NR
Ytterbium		Cadmium		Cobalt	0.001	Carbon	NR
Thulium		Silver		Iron	0.4	Boron	0.02
Erbium		Palladium		Manganese	0.01	Beryllium	
Holmium		Rhodium		Chromium	0.004	Lithium	0.08
Dysprosium						Hydrogen	NR

II B-207

NR - Not Reported

All elements not reported <0.005  $\mu\text{g/ml}$  ~~XXXXXXXXXX~~

\*Not reported upon request

\*\*Flameless Atomic Absorption

Approved:

*M. J. Jacobs*



## COMMERCIAL TESTING &amp; ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 726-8434



Reply to  
Instrumental Analysis Division  
14335 West 44th Avenue  
Golden, Colorado 80401

Phone: 303-278-9521

20 November 74

Mr. Frank Haas  
The Oil Shale Corporation  
18200 West Hiway 72  
Golden, CO 80401

Re: IAD #97-153-002-04

ANALYTICAL REPORT

	TOC* mg/liter	Nitrates** mg/liter N
✓ Aquifer Test #1 after pumping 15 hrs.	<1	0.34
Well 1-C String #2	8	0.10
ARCO SG #18-A T.D. 1330'	<1	0.22
ARCO SG-9 2750'	<1	0.056

\*Test performed on samples marked "Regular" and  
run by an outside laboratory.

\*\*Test performed on samples marked "Hg for N"

*Charles R. Wilson*  
Charles R. Wilson  
Analyst

*M. L. Jacobs*  
Approved by:  
M. L. Jacobs Ph.D.  
Divisional Manager

CRW/hb

II B-208





HAZEN RESEARCH, INC.  
4601 Indiana Street  
Golden, Colorado 80401

Mr. F. C. Haas  
The Oil Shale Corporation  
18200 West Highway 72  
Golden, Colorado 80401

Date: December 3, 1974  
HRI Project No. 535  
HRI Series No. 7559  
Samples received: November 1, 1974

# REPORT OF ANALYSIS

Analysis No.	Sample Designation	$\alpha$ pCi/l		$\alpha$ Precision*		$\beta$ pCi/l		$\beta$ Precision*		$Ra^{226}$ pCi/l		Precision*	
		Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$	Total	$\pm$
7559-1 ✓	Aquifer Test #1 Pumped 15 hrs.	4.2	$\pm$	2.3	$\pm$	0	$\pm$	11	$\pm$	0.3	$\pm$	0.5	$\pm$
-2	Well #1-C String #2	0.6	$\pm$	3.4	$\pm$	9	$\pm$	12	$\pm$	0	$\pm$	0.4	$\pm$
-3	SG-9 2750'	5.5	$\pm$	2.6	$\pm$	0	$\pm$	11	$\pm$	0.1	$\pm$	0.4	$\pm$
-4	SG-18-A TD 1380	8.0	$\pm$	3.3	$\pm$	0	$\pm$	11	$\pm$		$\pm$		$\pm$

II B-209

By: John C. Jarvis  
John C. Jarvis  
Manager, Analytical Laboratory

ljb

\*Variability of the radioactive disintegration process (counting error) at the 95% confidence level, 1.96 $\sigma$

RECEIVED

DEC 4 1974

OSCO-GOLDEN

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
John Matis

DATE RECEIVED: 11/1/74

DATE REPORTED: 12/9/74

LAB. NUMBER: 4321

SAMPLE MARKED: #1 Test - 15 Hours Test

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. REFRESHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

## ANALYSIS:

### MILLIGRAMS PER LITER

### MILLI-EQUIVALENTS

Calcium  
Magnesium  
Sodium  
Carbonate  
Bicarbonate

61  
7.9  
210  
24  
420

3.044  
0.650  
9.135  
0.799  
6.888

Chloride  
Sulfate  
Nitrate  
Phosphate  
Silicon dioxide

7  
210  
1.0  
Less than 0.1  
18

0.197  
4.368  
---  
---  
0.599

Iron  
Fluoride

Less than 0.05  
4.8

---  
0.126

P. alkalinity, in terms of  
calcium carbonate

---

### MILLIGRAMS PER LITER

MO alkalinity, in terms of  
calcium carbonate

Hardness, in terms of  
calcium carbonate  
Total dissolved solids  
(calculated)

180  
740

Aluminum Less than 0.1

Copper Less than 0.1

Cadmium Less than 0.01

Lead 0.12

Manganese Less than 0.05

Kjeldahl nitrogen

1.1

Ammonia-nitrogen

0.8

Lithium

Less than 0.05

Barium

Less than 1.0

Hexavalent chromium

Less than 0.01

Silver

Less than 0.01

Zinc

Less than 0.5

Mercury

Less than 0.01

pH 8.4

Specific conductance 990 micromhos per cc

Arsenic

Less than 0.01

Selenium

Less than 0.01

Boron

0.7

Hydroxide

Less than 0.1

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INSTITUTE OF FOOD TECHNOLOGY  
SIGMA XI

II B-210

THE INDUSTRIAL LABORATORIES COMPANY

*H. Paulsen*

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 28TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/15/75

LAB. NUMBER: 5943

SAMPLE MARKED: Water

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

ANALYSIS:	SG 1 12/6, 2,525'	SG 1 Para- chute	AT 1 12/23 9 AM	SG 17 1280-1309' 11/3
Calcium	20	16	16	7.4
Magnesium	13	11	9.5	5.3
Sodium	550	610	200	280
Potassium	Less than 1	Less than 1	Less than 1	Less than 1
Carbonate	Less than 0.1	Less than 0.1	Less than 0.1	Less than 0.1
Bicarbonate	1,280	1,330	570	700
Chloride	43	56	7.0	9.7
Fluoride	14	14	13	18
Sulfate	150	205	Less than 4	Less than 4
Boron	2.0	1.9	18.1	1.8
Silicon dioxide	13	13	16	12

Figures are milligrams per liter

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INSTITUTE OF FOOD TECHNOLOGY  
SIOMA XI

cc: Tosco

II B-211

THE INDUSTRIAL LABORATORIES COMPANY

*Paul Dele*  
CHEMIST

# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211  
ANALYSIS REPORT

TELEPHONE 455-3641

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202

Attn: John Matis

DATE RECEIVED: 1/6/75  
DATE REPORTED: 1/17/75

LAB. NUMBER: 5943

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ETC.) IN ADVANCE.

SAMPLE MARKED: Water

## ANALYSIS:

	SG 1 12/6 2,525'	SG 1 Para- chute	AT 1 12/23 9 AM	SG 17 1280-1309' 11/3
Calcium	0.988	0.798	0.798	0.369
Magnesium	1.070	0.905	0.782	0.436
Sodium	23.925	26.535	8.700	12.180
Bicarbonate	20.992	21.812	9.348	11.480
Chloride	1.213	1.580	---	0.274
Sulfate	3.120	4.264	---	---
Silicon dioxide	0.433	0.433	0.533	0.400
	SG 17 DST 18 1,374'	SG 17 12/12 DST 28 1,514-1,572'	SG 17 DST 21 12/10 1,473-1,522'	SG 17 12/14 DST 24 1,561-1,622'
Calcium	0.284	0.205	0.205	0.245
Magnesium	0.370	0.403	0.304	0.658
Sodium	11.310	13.050	10.875	14.138
Bicarbonate	10.988	12.136	10.332	13.612
Chloride	---	0.367	---	0.395
Fluoride	0.999	1.052	1.052	1.052
Sulfate	---	---	---	---
Silicon dioxide	0.533	0.566	0.533	0.566

Figures are milli-equivalents

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INSTITUTE OF PETROLEUM ENGINEERS  
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II B-212

THE INDUSTRIAL LABORATORIES COMPANY

*J. Paul Olsen*  
CHEMIST



# THE INDUSTRIAL LABORATORIES COMPANY

Analytical and Consulting Chemists

2600 WEST 29TH AVENUE  
DENVER, COLORADO 80211

TELEPHONE 455-3641

## ANALYSIS REPORT

ATLANTIC RICHFIELD COMPANY  
2 Park Central, Suite 555  
1515 Arapahoe Street  
Denver, Colorado 80202  
Attn: John Matis

DATE RECEIVED: 1/6/75  
DATE REPORTED: 3/10/75  
LAB. NUMBER: 5943

### RE-TEST

SAMPLES ARE DISCARDED IN 15 DAYS FROM DATE OF REPORT UNLESS WE ARE REQUESTED, IN WRITING, TO RETAIN THEM FOR A LONGER PERIOD. PERISHABLE SAMPLES ARE USUALLY DISCARDED IMMEDIATELY UNLESS CLIENT HAS REQUESTED SPECIAL HANDLING (FREEZING, ECT.) IN ADVANCE.

SAMPLE MARKED: AT 1 12/23 9 AM

### ANALYSIS:

Boron (retest)	1.5 milligrams per liter			
Fluoride (retest)	18	"	"	"
Sulfate (retest)	Less than 4.0	"	"	"
Total dissolved solids (calculated)	550	"	"	"

### MEMBERS OF:

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THE INDUSTRIAL LABORATORIES COMPANY

*H. Paul Ochs*

CHEMIST

THIS REPORT IS NOT TO BE REPRODUCED, IN WHOLE OR IN PART, FOR ADVERTISING PURPOSES WITHOUT OBTAINING PRIOR WRITTEN AUTHORIZATION



AT-1 PRELIMINARY 4 HOUR PUMP TEST

SEPTEMBER 15, 1974

TOSCO LAB DATA

Na	194
Ca	40
Mg	34
SO <sub>4</sub>	261
HCO <sub>3</sub>	435
Cl	3
F	2.7
Si	19
pH	8.2
Spec. cond.	1050 mmhos
TDS	767

NOTE: Pumping rate 400 gallons per minute, sample collected at end of test.



II B-7    AQUIFER DATA  
JETTING TESTS

A description of jetting test procedures and calculation methods was presented in Quarterly Report #1. During the second report period, jetting tests were run on wells SG-1, SG-17, SG-20 and SG-21 (Table II B-7.1).

TABLE II B-7.1  
JETTING TEST DATA

WELL	TEST NO.	DATE	DEPTH	TRANSMISSIVITY, T; gal/day/ft.
SG-1	JT-1	11- 4-74	450	4570
	JT-2	11- 7-74	706	4075
	JT-3	11-12-74	1036	3880
	JT-4	11-14-74	1105	4440
	JT-5	12- 1-74	2227	5160
	JT-6	12- 6-74	2525	4620
SG-17	JT-1	11-10-74	859	113
	JT-2	11-27-74	1250	916
	JT-3	12- 1-74	1336	1374
SG-20	JT-1	12- 4-74	515	7.5
	JT-2	12-12-74	986	9350
SG-21	JT-1	12-16-74	576	9.5

WELL SG-1  
JETTING TEST DATA

ARCO, ET AL @ 613'

PUMP TEST DATA SHEET ; WELL NO. SG#1

TEST WITH OPEN DRILL COLLARS, NO BIT &amp; BARREL

PUMPED WELL \_\_\_\_\_

OBSERVATION WELL \_\_\_\_\_

Drill pipe to 450'

DATE: 11-4-74

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT 21:00 (DRAWDOWN) (RECOVERY) TESTOFF 23:00WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT

MP 31 FT. ABOVE G.L. (GROUND LEVEL)

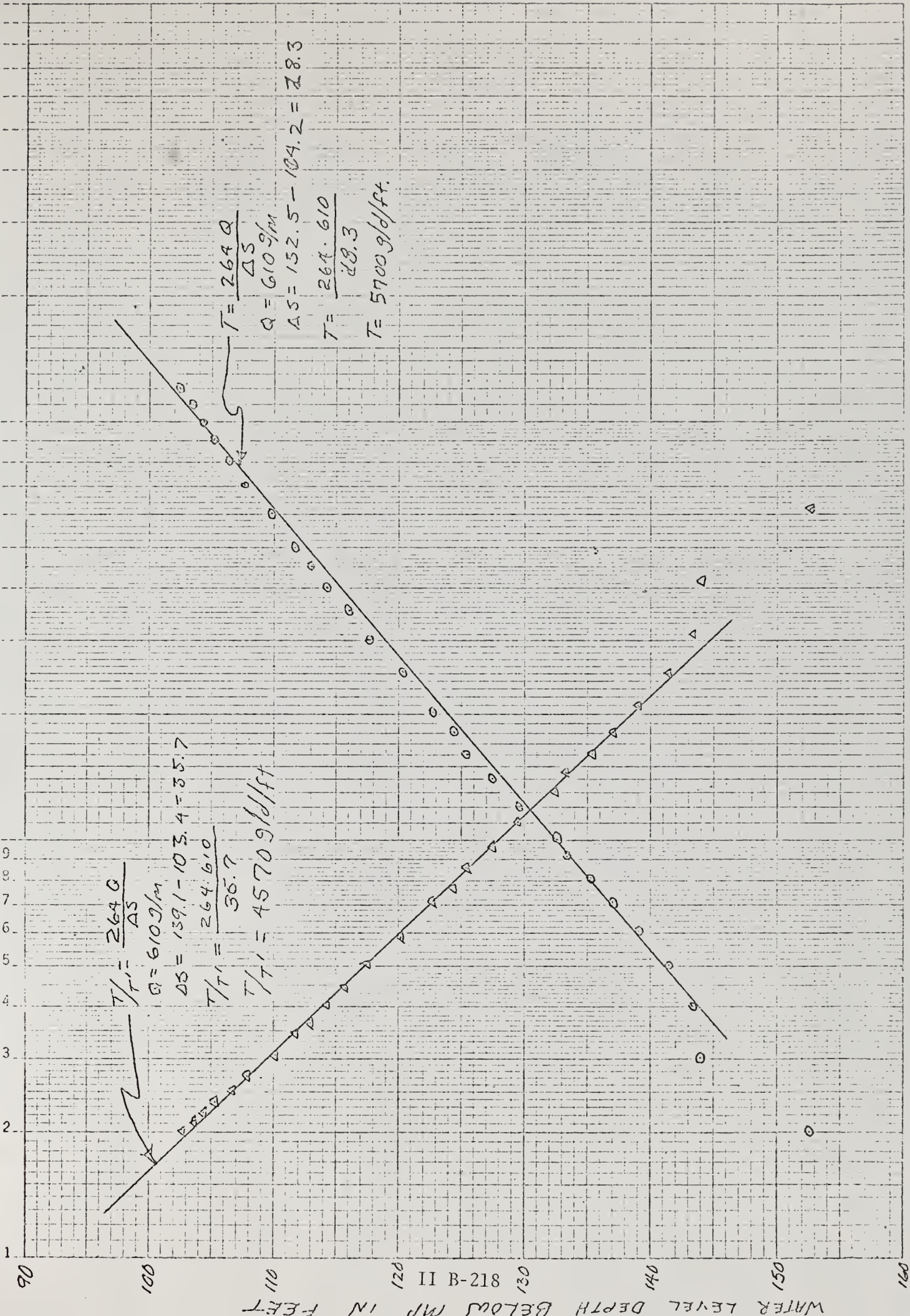
CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	0	Temp	COND	FLUME		12	129.7	11	
	10	13.5	950	.81		14	127.7	9.6	
	20		1000	.82		16	125.3	8.5	
	30			.82		18	124.4	7.6	
	40			.81		20	122.9	7.0	
	50			.80		25	120.3	5.8	
	60			.79		30	117.7	5.0	
	70			.78		35	116.0	4.4	
	80			.77		40	114.2	4.0	
	90					45	113.0	3.6	
	100					50	111.9	3.4	
	110					60	110.0	3.0	
	120	✓	✓	110.5		70	107.9	2.7	
	0			7/7'		80	106.7	2.5	
	1					90	105.2	2.3	
	2	152.7	61			100	104.4	2.2	
	3	144.0	41			110	103.4	2.1	
	4	143.5	31			120	102.5	2.0	
	5	141.6	25						
	6	139.1	21						
	7	137.2	18						
	8	135.5	16						
	9	133.2	14.3						
	10	132.5	13						



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# SORGHUM GULCH #1 JETTING TEST @ 613'



ARCO, ET AL TOP PARACHUTE CR. @ 706'  
PUMP TEST DATA SHEET; WELL NO. SG#1  
 OPEN ENDED COLLARS

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 11-7-74

STATIC WATER LEVEL 100'

PUMP (ON) (OFF) AT 4:00 (DRAWDOWN) (RECOVERY) TEST  
6:00

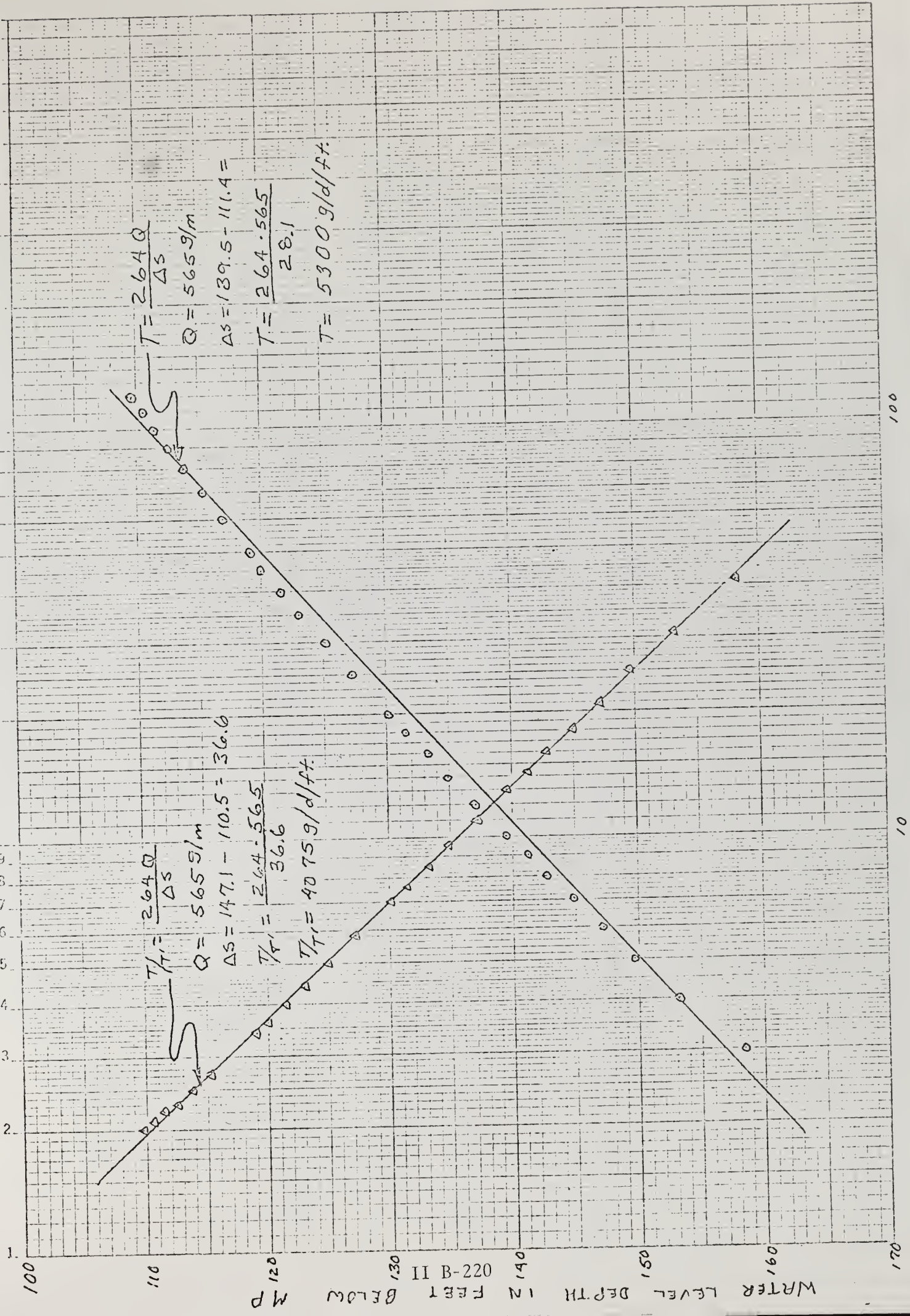
WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP 8 FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	0	TEMP	COND.	FLUME		12	137.0	11	
	10	13.0	1000	.80		14	134.9	9.6	
	20	14.0	950	.78		16	133.2	8.5	
	30			.76		18	131.5	7.6	
	40			.75		20	130.1	7.0	
	50			.75		25	127.2	5.8	
	60			.74		30	125.0	5.0	
	70			.74		35	123.0	4.4	
	80			.73		40	121.4	4.0	
	90			.72		45	120.0	3.6	
	100			.73		50	119.0	3.4	
	110			.73		60	116.9	3.0	
	120	✓	✓	.73 56.5 g/m		70	115.2	2.7	
	0			T/T		80	113.8	2.5	
	1					90	112.6	2.3	
	2					100	111.4	2.2	
	3	158.3	41			110	110.5	2.1	
	4	153.1	31			120	109.6	2.0	
	5	149.7	25						
	6	147.1	21						
	7	144.9	18						
	8	142.8	16						
	9	141.1	14.3						
	10	139.5	13						



## SORGHUM GULCH #1, JETTING TEST @ 706' TOP PARACHUTE CREEK



# PUMP TEST DATA SHEET ; WELL NO. 56-#1

431' OPEN ENDED COLLARS ; T.D.=1036'

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 11-12-74

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (~~OFF~~) AT 1330 (DRAWDOWN) (RECOVERY) TEST  
OFF 1530

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP=MEASURING POINT MP 9.4 FT. ABOVE G.L.(GROUND LEVEL)

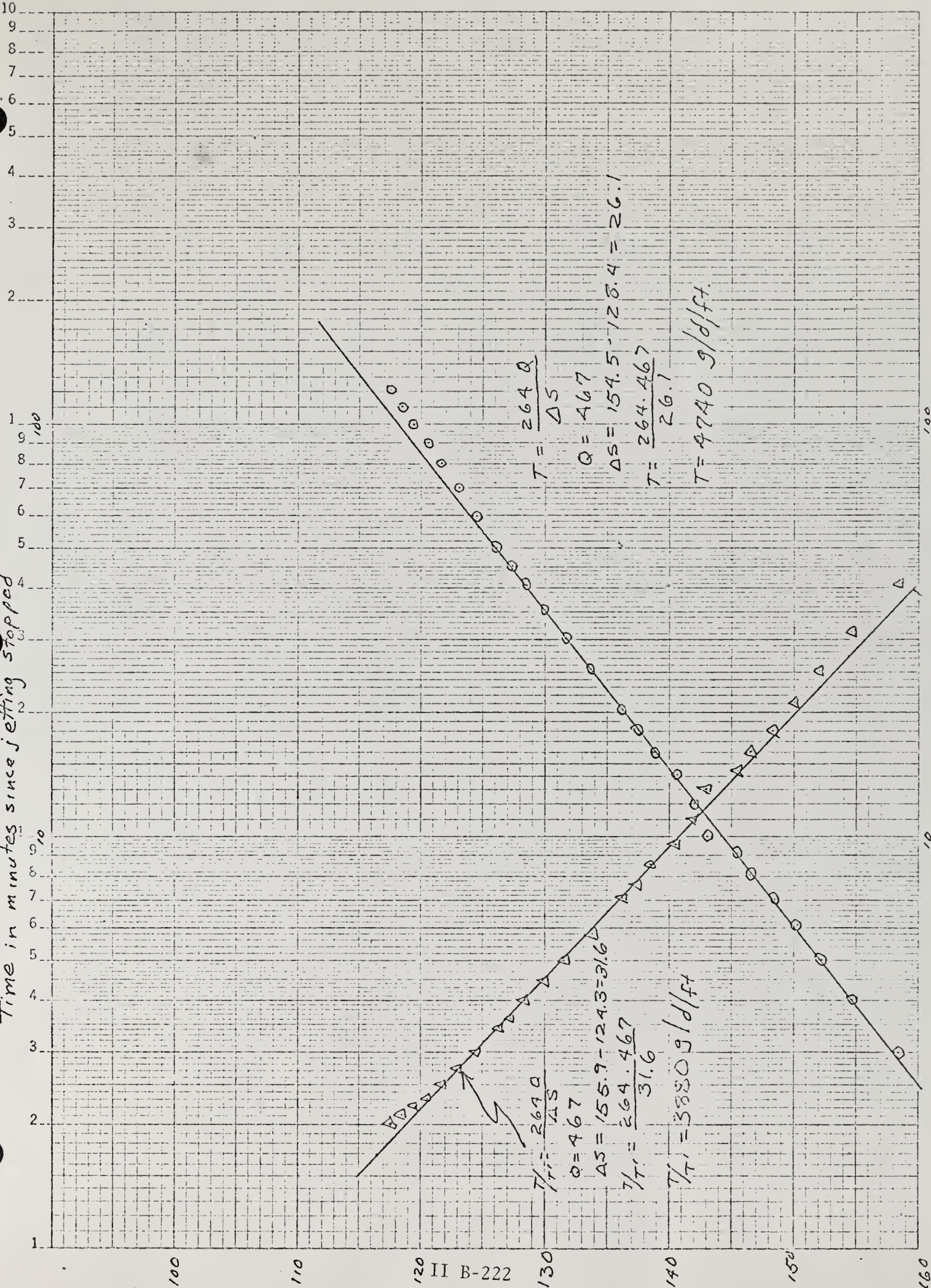
CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/T'	PUMP RATE
	0	TEMP.	COND.	FLUME		12	142.0	11		
	10	14.5	1100	.86		14	140.5	9.6		
	20	14.5	1050	.86		16	138.8	8.5		
	30	14.5	1000	.84		18	137.4	7.6		
	40	14.5		.83		20	136.1	7.0		
	50	14.0		.71		25	133.7	5.8		
	60	14.0		.66		30	131.8	5.0		
	70	14.5		.65		35	130.0	4.4		
	80			.66		40	128.5	4.0		
	90			.66		45	127.2	3.6		
	100			.65		50	126.2	3.4		
	110			.65		60	124.4	3.0		
	120	✓	✓	.65=46.29/m		70	123.0	2.7		
		WATER LEVEL DEPTH BELOW MP		T/T'		80	121.5	2.5		
	0					90	120.4	2.3		
	1					100	119.3	2.2		
	2					110	118.3	2.1		
	3	158.3	41			120	117.5	2.0		
	4	154.7	31							
	5	152.1	25							
	6	150.1	21							
	7	148.2	18							
	8	146.6	16							
	9	145.3	14.3							
	10	143.0	13							



Time in minutes since jetting stopped

WATER DEPTH FIELD M.P. II B-222

SG #1 JETTING TEST @ 1036.6' MINE ROOF





# PUMP TEST DATA SHEET ; WELL NO. 56-#1

## BASE MINE ZONE @ 1105' : WITH 800' OF PIPE

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 11-14-74

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT 800 (DRAWDOWN) (RECOVERY) TEST  
OFF AT 1000

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP \_\_\_\_\_ FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/T	PUMP RATE
	0	TEMP.	COND.	FLUME		12	136.9	11		
	10	14.0	1050	.90		14	143.7	9.6		
	20	15.	1000	.90		16	142.8	8.5		
	30	15.		.88		18	141.4	7.6		
	40	15.		.86		20	139.7	7.0		
	50	15.		.84		25	136.5	5.8		
	60	15.5		.84		30	134.3	5.0		
	70	15.5		.83		35	131.9	4.4		
	80	15.		.82		40	130.7	4.0		
	90	15.				45	128.9	3.6		
	100					50	127.7	3.4		
	110					60	125.6	3.0		
	120					70	123.7	2.7		
						80	122.3	2.5		
	0	WATER LEVEL DEPTH BELOW MP				90	120.9	2.3		
	1					100	119.9	2.2		
	2					110	118.7	2.1		
	3	85.4'	41			120	117.7	2.0		
	4	118.6'	31							
	5	122.0	25							
	6	126.8	21							
	7	127.5	18							
	8	125.5	16							
	9	127.8	14.3							
	10	131.6	13							

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TIME IN MINUTES SINCE JETTING STOPPED

WATER LEVEL DEPTH BELOW IMP

$$\frac{T}{T'} = \frac{264Q}{\Delta S}$$

$$Q = 673 \text{ g/m}$$

$$\Delta S = 146 - 106 = 40$$

$$T/T' = \frac{264 \cdot 2.73}{40}$$

$$T/T' = 1.440 \text{ g/d/ft.}$$

$$T = \frac{264Q}{\Delta S}$$

$$Q = 673 \text{ g/m}$$

$$\Delta S = 148.0 - 119 = 29$$

$$T = \frac{264 \cdot 673}{29}$$

$$T = 6130 \text{ g/d/ft.}$$

JETTING TEST @ 1105', BASE MINE ZONE

SORGHUM GULCH #1



# PUMP TEST DATA SHEET ; WELL NO. SC-41

1,000' open ended

PUMPED WELL SC-41 OBSERVATION WELL SC-41

DATE: 12-1-74 STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT 1245 (DRAWDOWN) (RECOVERY) TEST

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP \_\_\_\_\_ FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
1245	0	Temp	Cond	Flow		14		11.0	
	10	18.0	1500	6.2		14	1296.0	9.6	
	20	18.0	2400	7.7		16	89.3	8.5	
	30	18.0	3000	8.8		18	80.4	2.6	
	40	18.0	4000	3.9		20	26.8	2.0	
	50	18.0	4000	9.0		25	124.5	5.8	
	60	18.0	4000	9.1		30	124.2	5.0	
	70	18.0	4000	9.1		35	172.9	4.4	
	80	18.0	4000	9.1		40	146.5	4.0	
	90	18.0	4000	9.1		45	128.9	3.6	
	100	18.0	4000	9.1		50	129.6	3.4	
	110	18.0	4000	9.1		60	121.7	3.0	
	120	18.0	4000	9.1 = 794 <sup>gpm</sup>		70	120.1	2.7	
		• Water Level Depth Below MP				80	119.8	2.5	
	0			7/1		90	117.2	2.3	
	1					100	116.0	2.2	
	2					110	115.8	2.1	
	3			41		120	114.6	2.0	
	4	178.5		31					
	5	168.1		25					
	6	151.4		21					
	7	146.0		18					
	8	126.7		16					
	9	120.3		14.3					
	10			13					

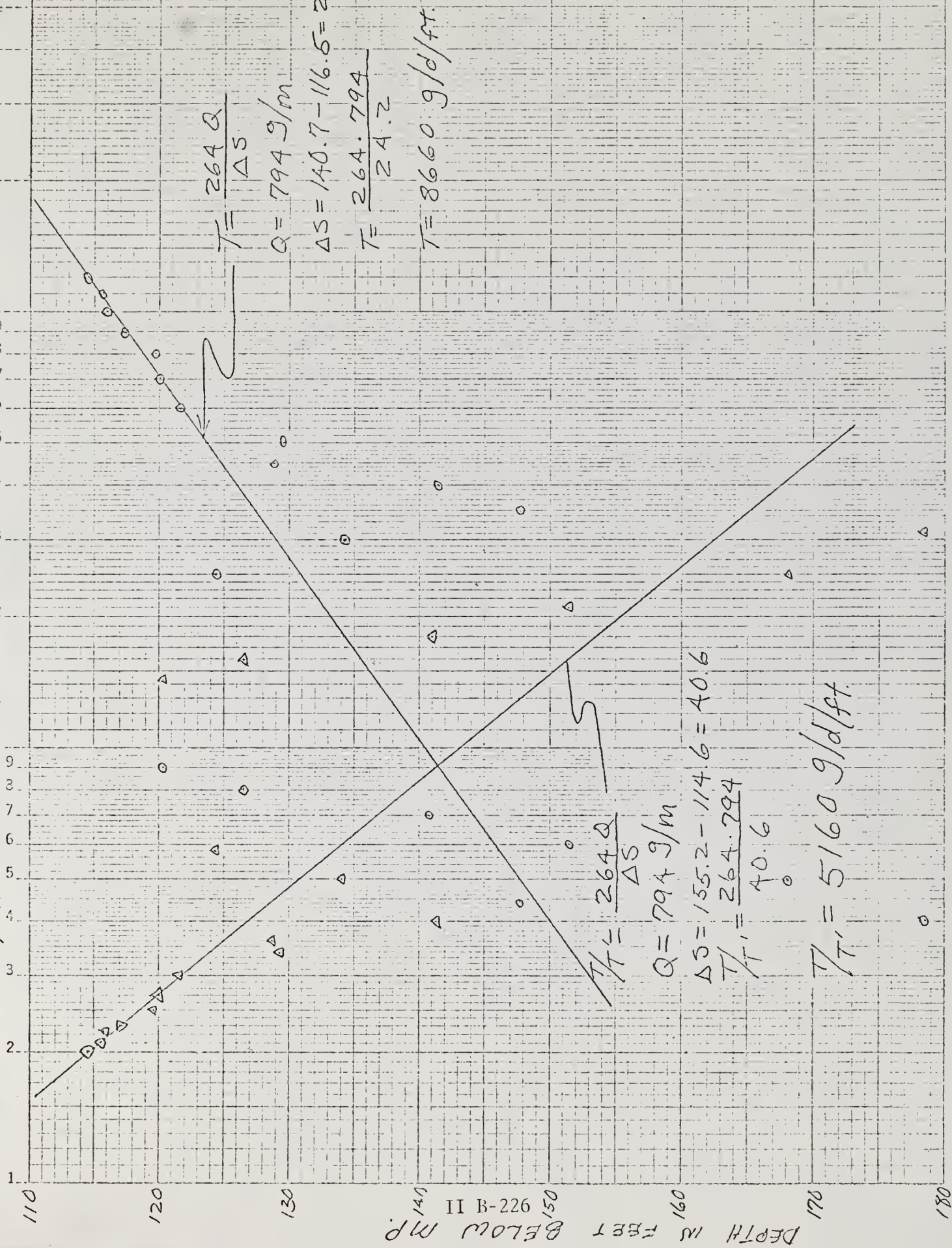
ARCO, ET. AL. SORGHUM GULCH #1 JETTING TEST @ 2222.1

DEPTH IN FEET BELOW M.P. II B-226

100

10

TIME IN MINUTES





ARCO, et al PUMP TEST DATA SHEET ; WELL NO. SG#1  
 SG#1 1000' OPEN ENDED

@ 2525 PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

TOTAL DEPTH \_\_\_\_\_ DATE: 12-6-74 STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) ~~(OFF)~~ AT 9:00 (DRAWDOWN) (RECOVERY) TEST  
 OFF AT 11:00

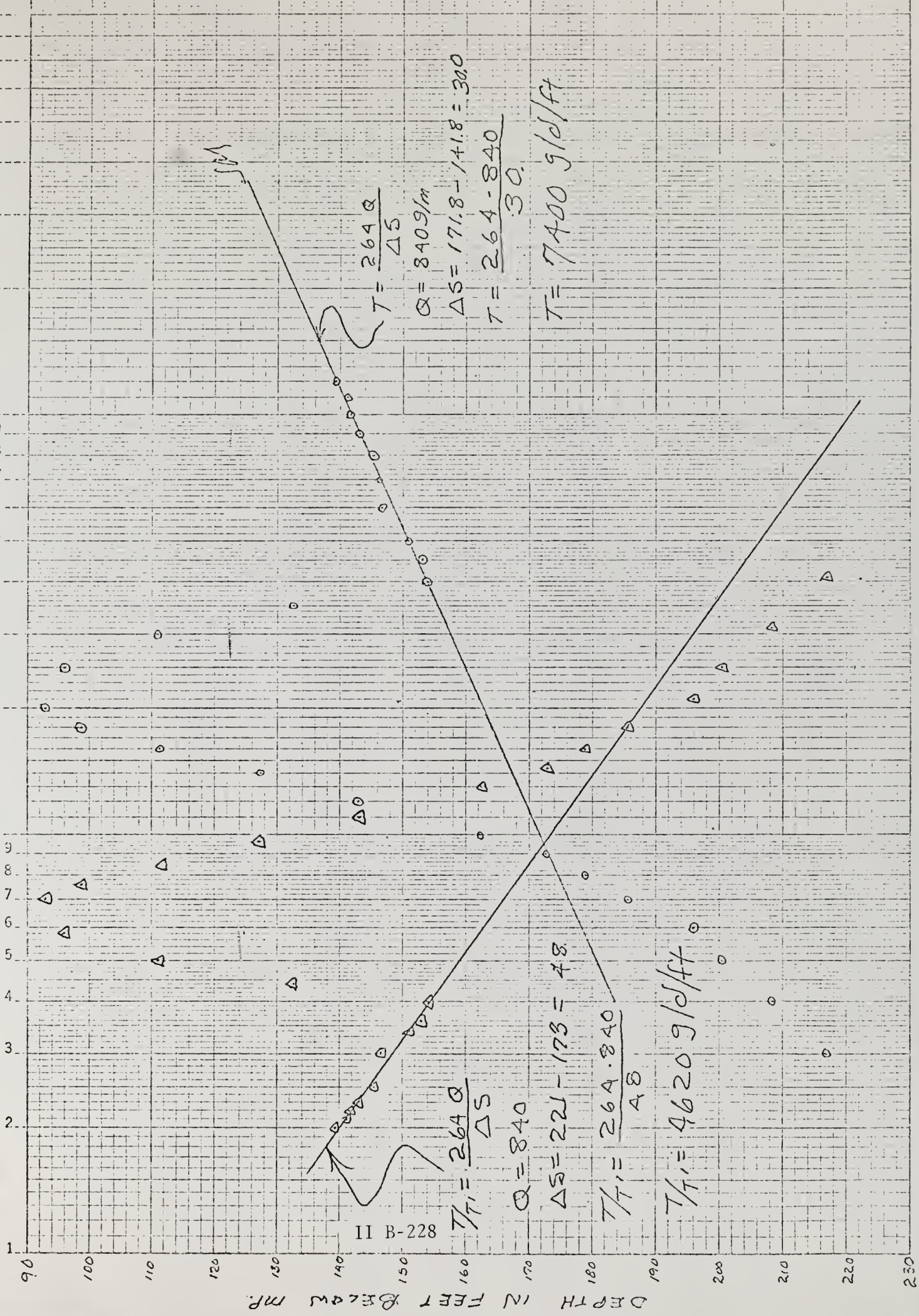
WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP \_\_\_\_\_ FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/T	PUMP RATE
	0	TEMP	COND.	FLUME		12	143.	11		
	10	16	1200	.40		14	127.5	9.6		
	20	17	1400	.61		16	111.4	8.5		
	30	18	1530	.81		18	98.7	7.6		
	40	18	1530	.86		20	93.	7.0		
	50	18.5	1650	.91		25	96.	5.8		
	60	18.5	1800	.94		30	111.	5.0		
	70	18.5	1850	.94		35	132.5	4.4		
	80	18.5	1900	.94		40	154.	4.0		
	90	18.5	1900	.94		45	153.	3.6		
	100	18.5	1900	.94		50	150.8	3.4		
	110	18.5	1900	.94		60	146.3	3.0		
	120	18.5	1900	.94 = 839 $\frac{9}{100}$		70	146.1	2.7		
	0	Water Level DEPTH BELOW MP		T/T		80	145.5	2.5		
	1					90	143.2	2.3		
	2	233.8	61			100	141.8	2.2		
	3	217.3	41			110	141.3	2.1		
	4	208.3	31			120	139.6	2.0		
	5	200.5	25							
	6	196.6	21							
	7	185.7	18							
	8	178.8	16							
	9	172.4	14.3							
	10	162.2	13							



SORGHUM GULCH #1 JETTING TEST @ T.O. 2525



TIME IN MINUTES

WELL SG-17  
JETTING TEST DATA

PUMP TEST DATA SHEET; WELL NO. SG #17

Top of Parachute Creek

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 11-10-74

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT \_\_\_\_\_ (DRAWDOWN) (RECOVERY) TESTWATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)MP = MEASURING POINT MP 19 FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	0	0°C	4 mbs	FLAME		12	588.35	13 1/2'	11.0
	10	8.5	1000	—		14	564.15	13 1/4'	9.6
	20	12.0	800	.12		16	549.80	13 1/6'	5.5
	30	12.5	800	.12		18	534.72	13 7/8'	7.7
	40	12.5	800	.12		20	529.45	14 1/2'	7.0
	50	13.0	800	.12		25	515.05	14 5/8'	5.8
	60	13.0	800	.11		30	504.07	15 1/2'	5.0
	70	12.5	800	.11		35	494.40	15 3/4'	4.4
	80	12.0	800	.11		40	487.10	16 1/4'	4.0
	90	12.0	800	.11		45	482.02	16 3/4'	3.7
	100	12.0	800	.11		50	478.90	17 1/2'	3.4
	110	12.0	800	.11		55	476.33	17 5/8'	3.2
	120	12.0	800	.11		60	474.24	18 1/2'	3.0
			T/T'			70	470.20	19 1/2'	2.7
	0					80	468.60	20 3/4'	2.5
	1					90	466.60	21 1/2'	2.3
	2					100	465.40	22 1/2'	2.2
	3					110	464.25	23 1/2'	2.1
	4					120	463.15	24 1/2'	2.0
	5						19		
	6						T = 216 g/d/H		
	7								
	8						T/T' = 113 g/d/H		
	9								
	10	604.10	13 1/2'	13.0					



PUMP TEST DATA SHEET ; WELL NO. SG-17

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 11-27-74

STATIC WATER LEVEL \_\_\_\_\_

2237 0037  
PUMP (ON) (OFF) AT \_\_\_\_\_ (DRAWDOWN) (RECOVERY) TEST

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP 14'5" FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	0	Temp	Cond.	Flume		12	500	11	
	10	17°	1200	.26		14	491.7	9.6	
	20	17.5°	1300	.26		16	485.5	8.5	
	30	18°	1400	.25		18	481.3	7.7	
	40	18°	1400	.25		20	478.9	7.0	
	50	18°	1400	.25		25	474.8	5.8	
	60	18°	1400	.25		30	470.0	5.0	
	70	18°	1400	.25		35	468.8	4.4	
	80	18°	1400	.25		40	465.5	4.0	
	90	18°	1400	.25		45	464.5	3.7	
	100	18°	1400	.25		50	463.6	3.4	
	110	18°	1400	.25		55	462.6	3.2	
	120	18°	1400	.25		60	462.0	3.0	
						70	460.6	2.7	
	0					80	459.5	2.5	
	1					90	458.7	2.3	
	2					100	457.8	2.2	
	3					110	457.1	2.1	
	4					120	456.4	2.0	
	5						T = 1915 g/d/ft		
	6						T/T' = 915.6 g/d/ft		
	7								
	8								
	9								
	10								

Arco Et. AL. Sorghum Gulch #17 Jetting Test @ 1336'

PUMP TEST DATA SHEET; WELL NO. SG #17NEAR BASE OF  
MINE FLOORPUMPED WELL SG #17 OBSERVATION WELL \_\_\_\_\_DATE: 12/1/54 STATIC WATER LEVEL \_\_\_\_\_PUMP (ON) (~~OFF~~) AT 18:03 (DRAWDOWN) (RECOVERY) TEST

OFF 20:03

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN YES (NO)MP = MEASURING POINT MP 15' FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/T'	PUMP RATE
	0	Temp. Conduct.		Flume		12	496.8		11	
	10	20°	1200	—		14	487.6		9.6	
	20	21°	1150	.36		16	480.9		8.5	
	30	21	1150	.33		18	477.0		7.7	
	40	21	1250	.32		20	474.2		7.0	
	50	21	1200	.31		25	469.2		5.8	
	60	21	1200	.32		30	467.6		5.0	
	70	21	1200	.31		35	465.0		4.4	
	80	21	1200	.31		40	464.3		4.0	
	90	21	1200	.32		45	463.4		3.7	
	100	21	1250	.32		50	462.4		3.4	
	110	21	1250	.32		55	461.7		3.2	
	120	21	1250	.32		60	461.0		3.0	
			T/T'			70	459.7		2.7	
	0					80	458.6		2.5	
	1					90	457.7		2.3	
	2					100	457.0		2.2	
	3					110	456.3		2.1	
	4	574.7	31			120	455.6		2.0	
	5	564.4	25							
	6	550.3	20							
	7	537.3	18							
	8	525.7	16							
	9	518.1	14							
	10	510.8	13							

T = 2125 g/d/H

T/T' = 1374 g/d/H



Jetting Test @ 1622 FT.  
 Arco, etal PUMP TEST DATA SHEET ; WELL NO. 56-17

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 12-13-74 STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT 21:19 (DRAWDOWN) (RECOVERY) TEST  
 OFF @ 23:19

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP \_\_\_\_\_ FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	0	Temp	Cond	Flume		12	530.4	11	
	10	19.0°	1200	.39		14	523.1	9.6	
	20	20.0°	1250	.37		16	519.4	8.5	
	30	21.0°	1200	.37		18	516.4	7.7	
	40	21.0°	1200	.37		20	513.9	7.0	
	50	21.0°	1200	.37		25	509.0	5.8	
	60	21.0°	1200	.37		30	506.5	5.0	
	70	21.0°	1200	.37		35	504.4	4.4	
	80	21.0°	1200	.36		40	503.3	4.0	
	90	21.0°	1200	.36		45	502.6	3.7	
	100	21.0°	1200	.36		50	501.6	3.4	
	110	21.0°	1200	.36		55	500.7	3.2	
	120	21.0°	1200	.36		60	499.9	3.0	
						70	498.4	2.7	
	0		T/T			80	497.1	2.5	
	1					90	496.0	2.3	
	2					100	495.0	2.2	
	3					110	494.0	2.1	
	4		31			120	493.2	2.0	
	5	572.4	25						
	6	564.0	21						
	7	558.6	18						
	8	550.3	16						
	9	544.0	14						
	10	538.8	13						

ARCO, ET AL.

JETTING TEST

PUMP TEST DATA SHEET; WELL NO. SG#17

@TOP GARDEN BULCH 2405'

1000' OF OPEN END PIPE

PUMPED WELL \_\_\_\_\_

OBSERVATION WELL \_\_\_\_\_

DATE: 1-9-75

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT \_\_\_\_\_ (DRAWDOWN) (RECOVERY) TEST

WATER TEMP. 24.5 CONDUCTIVITY 3800 SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP \_\_\_\_\_ FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	0	°C	Amohs	Flume		12	516	$\frac{132}{12}$	11.0
	10	2.0	1500	.47		14	498.4	$\frac{134}{14}$	9.6
	20	20	1600	.33		16	495.2	$\frac{136}{16}$	8.5
	30	20	1700	.31		18	491.9	$\frac{138}{18}$	7.7
	40	20	1600	.23		20	490.0	$\frac{140}{20}$	7.0
	50	22	6000	.24		25	487.0	$\frac{145}{25}$	5.8
	60	23	6500	.33		30	487.8	$\frac{150}{30}$	5.0
	70	23	5200	.22		35	487.9	$\frac{155}{35}$	4.4
	80	23	5200	.25		40	487.9	$\frac{160}{40}$	4.0
	90	23	5200	.30		45	488.	$\frac{165}{45}$	3.7
	100	23	4400	.31		50	491.1	$\frac{170}{50}$	3.4
	110	23	4400	.35		55	492.2	$\frac{175}{55}$	3.2
	120	23	4400	.33 = $162\frac{9}{m}$		60	493.4	$\frac{180}{60}$	3.0
		WATER LEVEL DEPTH BELOW MP				70	494.0	$\frac{190}{70}$	2.7
	0			T/T		80	492.9	$\frac{200}{80}$	2.5
	1					90	492.4	$\frac{210}{90}$	2.3
	2					100		$\frac{220}{100}$	2.2
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10	517.2	$\frac{130}{10}$	13.0					

WELL SG-20  
JETTING AND DRILL STEM  
TEST DATA



# PUMP TEST DATA SHEET ; WELL NO. SG-20

PUMPED WELL SG-20 OBSERVATION WELL \_\_\_\_\_

DATE: 12/4 STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) ~~(OFF)~~ AT 9:50 AM ~~(10:00 AM)~~ 11:50 ~~(12:00 PM)~~ **(RECOVERY)** TEST  
 WATER TEMP. 12°C CONDUCTIVITY 850 ~~mm~~ SAMPLE TAKEN **(YES)** ~~(NO)~~

MP = MEASURING POINT MP 5' FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/r	PUMP RATE
9:50	0	Temp	Conductivity	Flume		12	162.9			
	10	11°	800	Not UP		14	142.8			
	20	11°	850	Not UP 10±		16	127.3			
	30	11°	850	"		18	114.0			
	40	10.5°	850	"		20	102.3			
	50	11°	850	"		25	80.7			
	60	10.5°	850	"		30	65.6			
	70	11°	850	"		35	55.5			
	80	11.5°	850	.02		40	48.2			
	90	12°	850	.03		45	43.9			
	100	12°	850	.03		50	40.9			
	110	12°	850	.04		60	36.9			
	120	12°	850	.04		70	35.1			
				Q = 8.8 gpm		80	33.6			
				T/r		90	32.8			
	1					100	31.9			
	2					110	31.2			
	3					120	31.0			
	4									
	5									
	6									
	7	232.7								
	8	223.8								
	9	193.4								
	10	180.7								

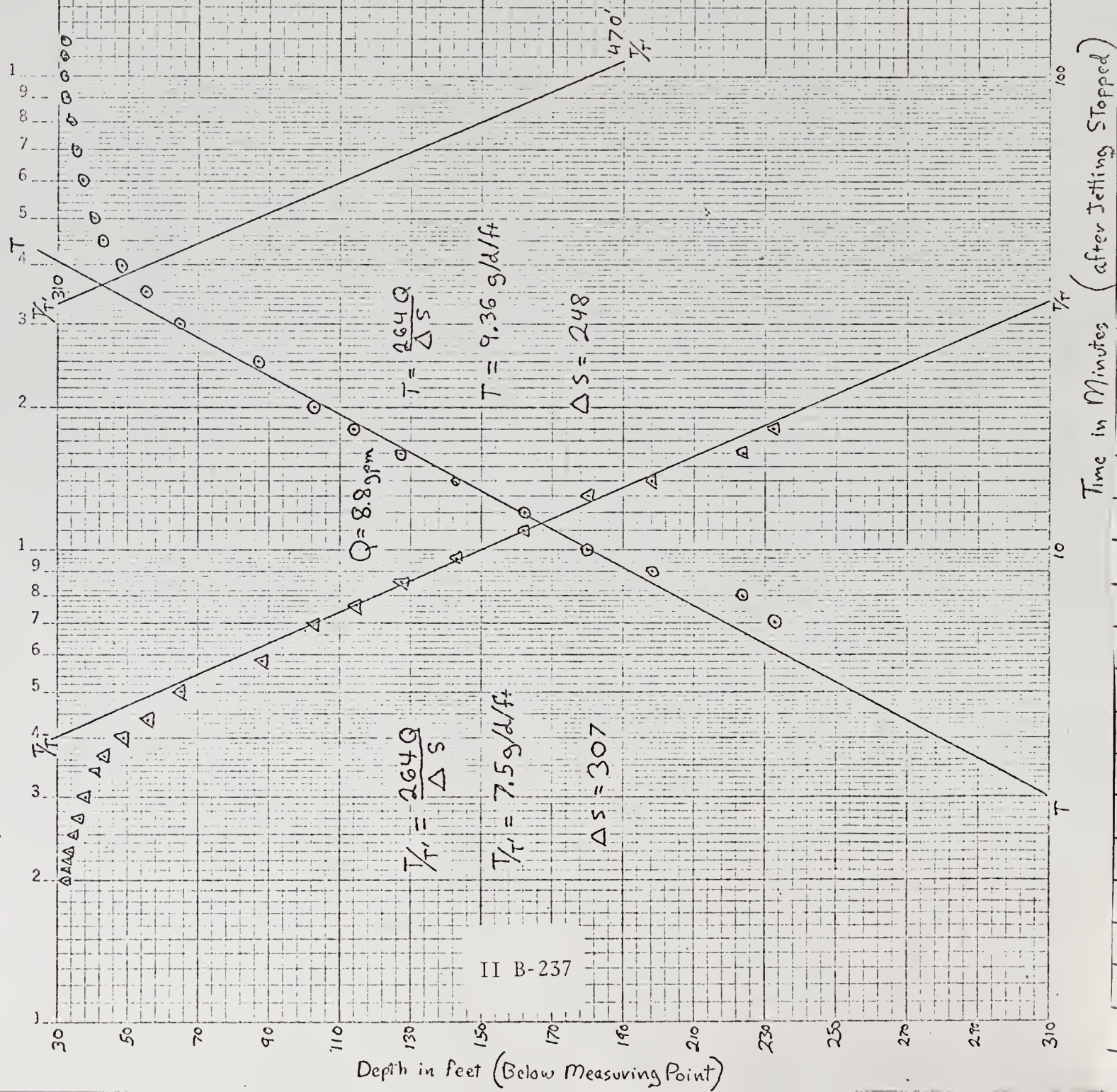
$$T = 9.36 \text{ g/d/ft}$$

$$T/r = 7.5 \text{ g/d/ft}$$

Top of Parachute Creek 212  
46 5493

Jetting /es/;  
SEMI-LOGARITHMIC 3 CYCLES 70 DIVISIONS  
REUFEL & ESSER CO. MADE IN USA

II B-237





# Jet Test Top of Mine Zone 986'

## PUMP TEST DATA SHEET ; WELL NO. SG-20

PUMPED WELL SG-20 OBSERVATION WELL \_\_\_\_\_

DATE: 12/12/74 STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (~~OFF~~) AT 0245 (~~DRAWDOWN~~) (RECOVERY) TEST

WATER TEMP. ✓ CONDUCTIVITY ✓ SAMPLE TAKEN (YES) (~~NO~~)

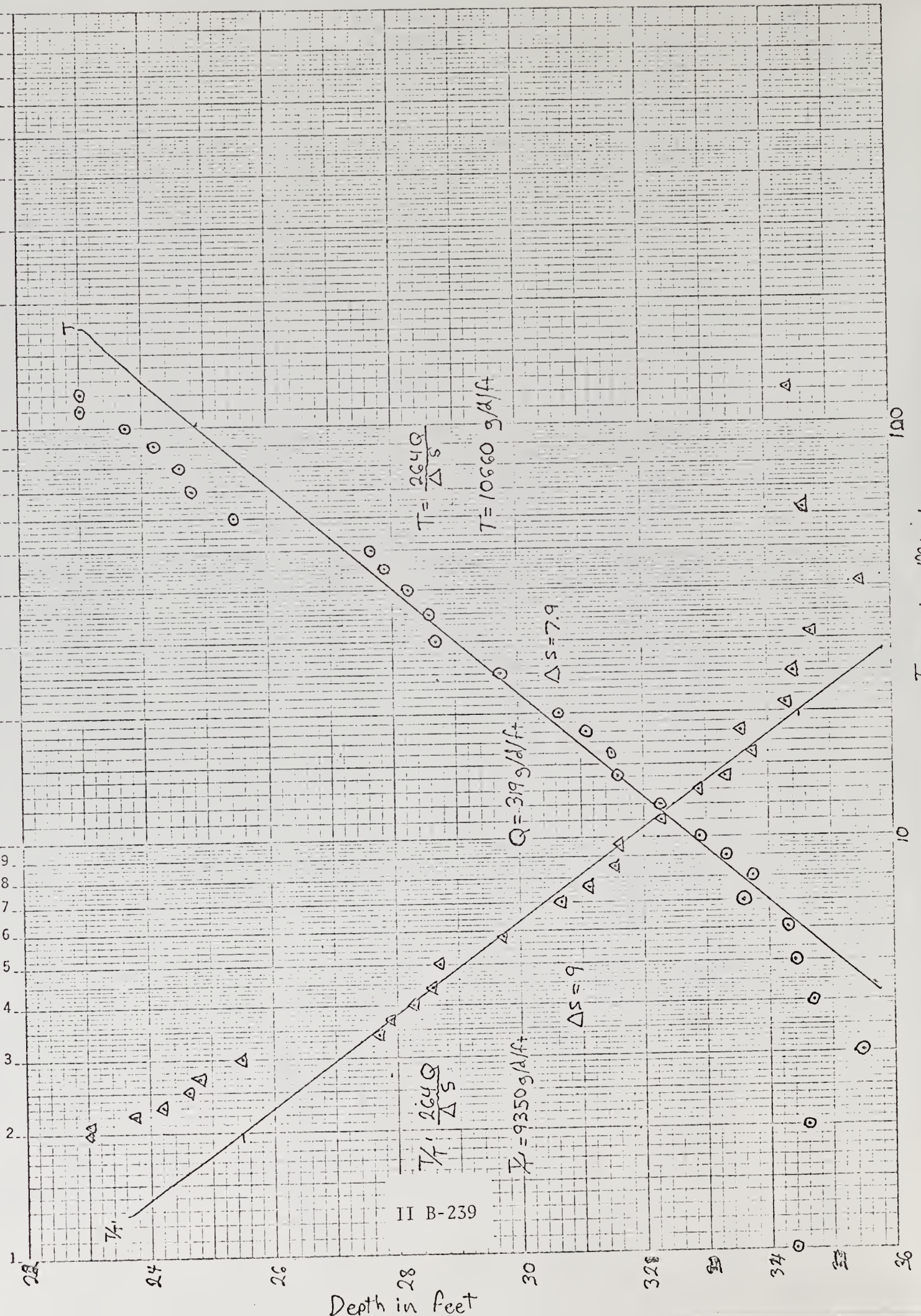
MP = MEASURING POINT MP 2.2' FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/T'	PUMP RATE
	00	Cond	Temp	Flume		12	32.25	11		
	10	2400	19°	0		14	31.6	9.5		
	20	2400	19°	0		16	31.5	8.5		
	30	2600	20°	.40		18	31.09	7.6		
	40	2600	20°	.46		20	30.64	7.0		
	50	2600	20°	.50		25	29.73	5.8		
	60	2600	20°	.51		30	28.67	5.0		
	70	2600	20°	.51		35	28.6	4.4		
	80	2800	20°	.51		40	28.25	4.0		
	90	2800	20°	.51		45	27.9	3.7		
	100	2800	20°	.51		50	27.65	3.4		
	110	2800	20°	.51		60	25.45	3.6		
	120	2800	20°	.51		70	24.80	2.7		
						80	24.6	2.5		
						90	24.2	2.3		
	1	34.46	121			100	23.76	2.2		
	2	34.6	61			110	23.02	2.1		
	3	35.5	41			120	23.01	2.0		
	4	34.65	31							
	5	34.4	25							
	6	34.3	21							
	7	33.6	18							
	8	33.75	16							
	9	33.3	14							
	10	32.9	13							

46 5493

SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS  
KEUFFEL & ESSER CO. MADE IN U.S.A.

Setting Test Top of Mine Zone 986'



II B-239



# PUMP TEST DATA SHEET ; WELL NO. SG-20

DST #1

PUMPED WELL SG-20

OBSERVATION WELL \_\_\_\_\_

DATE: 12/8/74

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT \_\_\_\_\_ (~~DRAW/DOWN~~) (RECOVERY) TEST

WATER TEMP. \_\_\_\_\_ CONDUCTIVITY \_\_\_\_\_ SAMPLE TAKEN (~~YES~~) (NO)

Recovery

MP = MEASURING POINT

MP 105 FT. ABOVE G.L. (GROUND LEVEL)

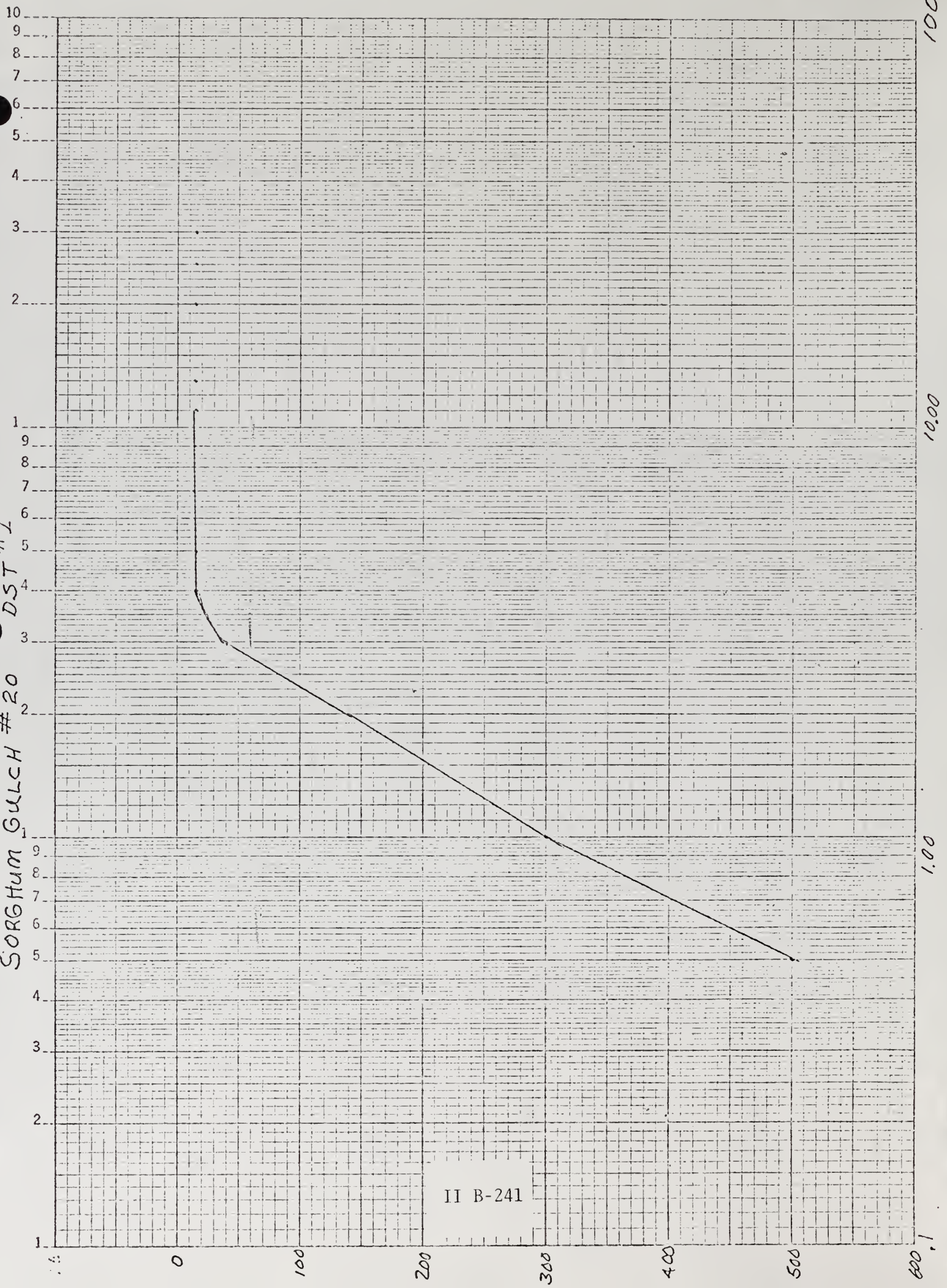
CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
3:13	-	577.6				Time	Conduct	°C	
3:25		Cycle Tool			8:55	60	2800	19°	
3:28	0	Tool Open				70	2800	19°	
3:28½	½	500 (apx)			off @	7:06			
3:29	1	300 (apx)							
	2	140 (apx)					27.3	3pm	Production Rate
	3	40 (apx)							
	4	16.1							
	5	16.7							
	7	15.6							
	9	15.4							
	11	15.2							
	15	15.0							
	20	16.0							
	25	16.0							
	30	15.4							
		Conductivity							
	Time	Conduct	Temp	°C					
7:55	0	2800	13°						
	10	2800	15.5°						
	20	2800	16.5°						
	30	2800	17.0						
	40	2750	18.5						
	50	2800	18.5						

KEE SEMI-LOGARITHMIC • 2 CYCLES X 70 DIVISIONS  
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 5493

Sorghum Gulch #20  
DST #1

II B-241



TIME IN MINUTES



DST #2

981' top of Mine Zone

SG 20

PUMP TEST DATA SHEET ; WELL NO. SG 20

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: \_\_\_\_\_ STATIC WATER LEVEL \_\_\_\_\_

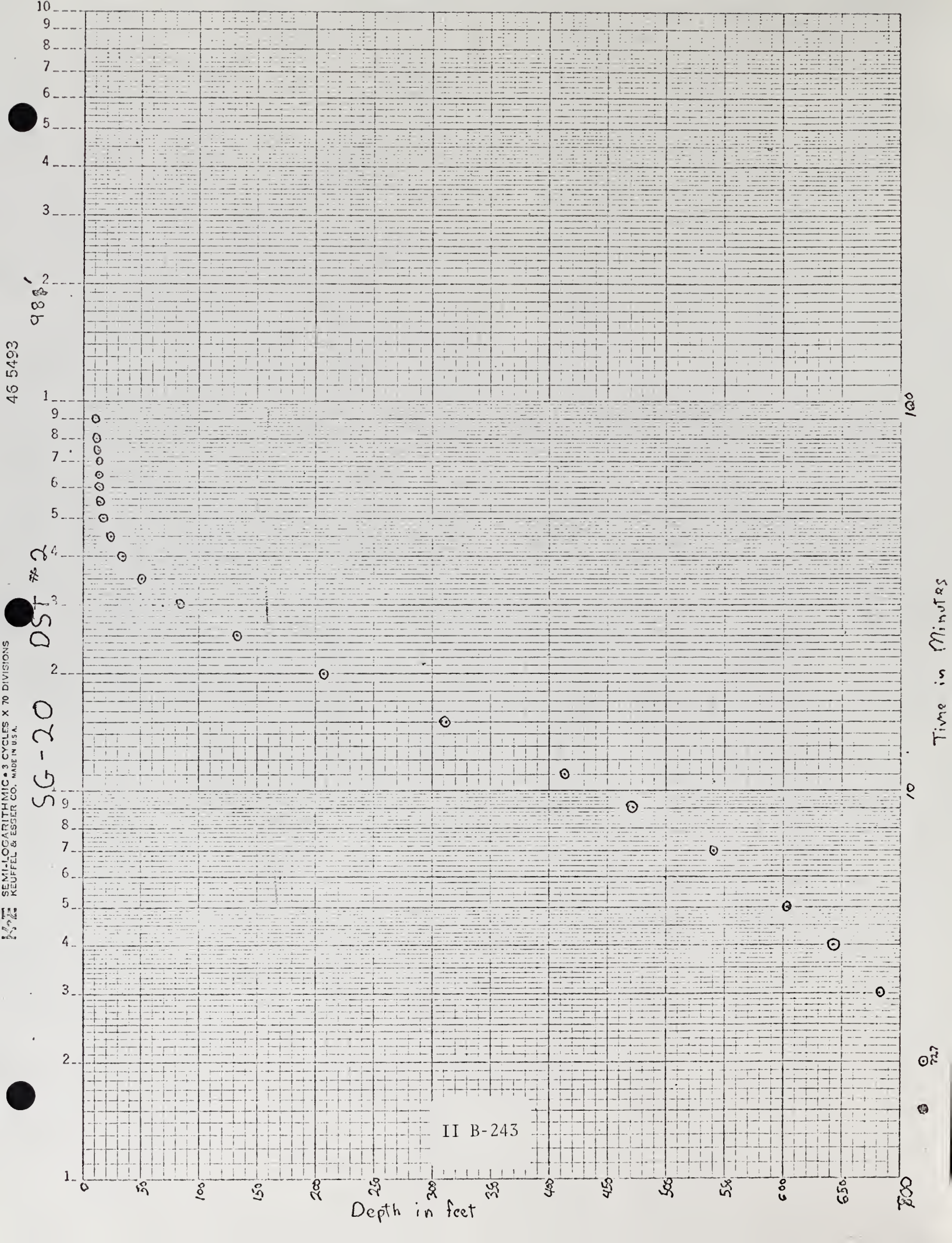
PUMP (ON) (OFF) AT \_\_\_\_\_ (DRAWDOWN) (RECOVERY) TEST

WATER TEMP. \_\_\_\_\_ CONDUCTIVITY \_\_\_\_\_ SAMPLE TAKEN (YES) (NO)

MP= MEASURING POINT

MP 8.4' FT. ABOVE G.L.(GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
		854.13'			1116	80	11.4		
0952		cycle Tool			1126	90	10.5		
0956	0	Tool open							
0957	1/2	810.6							
0958	1	764.8					COND.	Temp?	9/m ≈
0959	2	<del>632</del> 727.2			1615	0	2300	12.5	9
0000	3	682.6			1625	10	2400	12.5	12.9/m
0001	4	642.9			1635	20	2250	12.5	13 3/4 m ≈
0003	5	604.0			1645	30	2300	13	12
0005	7	540.3			1655	40	2200	13.5	12
0007	9	472.9			1705	50	2400	14	12
0001	11	413.1			1715	60	2400	14	12
0016	15	311.9							
0021	20	207.8							
	25	133.4							
	30	84.8							
	35	50.1							
	40	33.1							
	45	24.7							
	50	19.6							
	55	16.1							
	60	14.5							
	65	13.2							
	70	13.0							
	75	11.9							



WELL SG-21  
JETTING AND DRILL STEM  
TEST DATA



5 1/2" of open ended pipe  
**PUMP TEST DATA SHEET ; WELL NO. 56# 21**

Top Parachute Cr. 650' Test @ 676'

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 12-16-74

STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT 600 (DRAWDOWN) (RECOVERY) TEST  
800

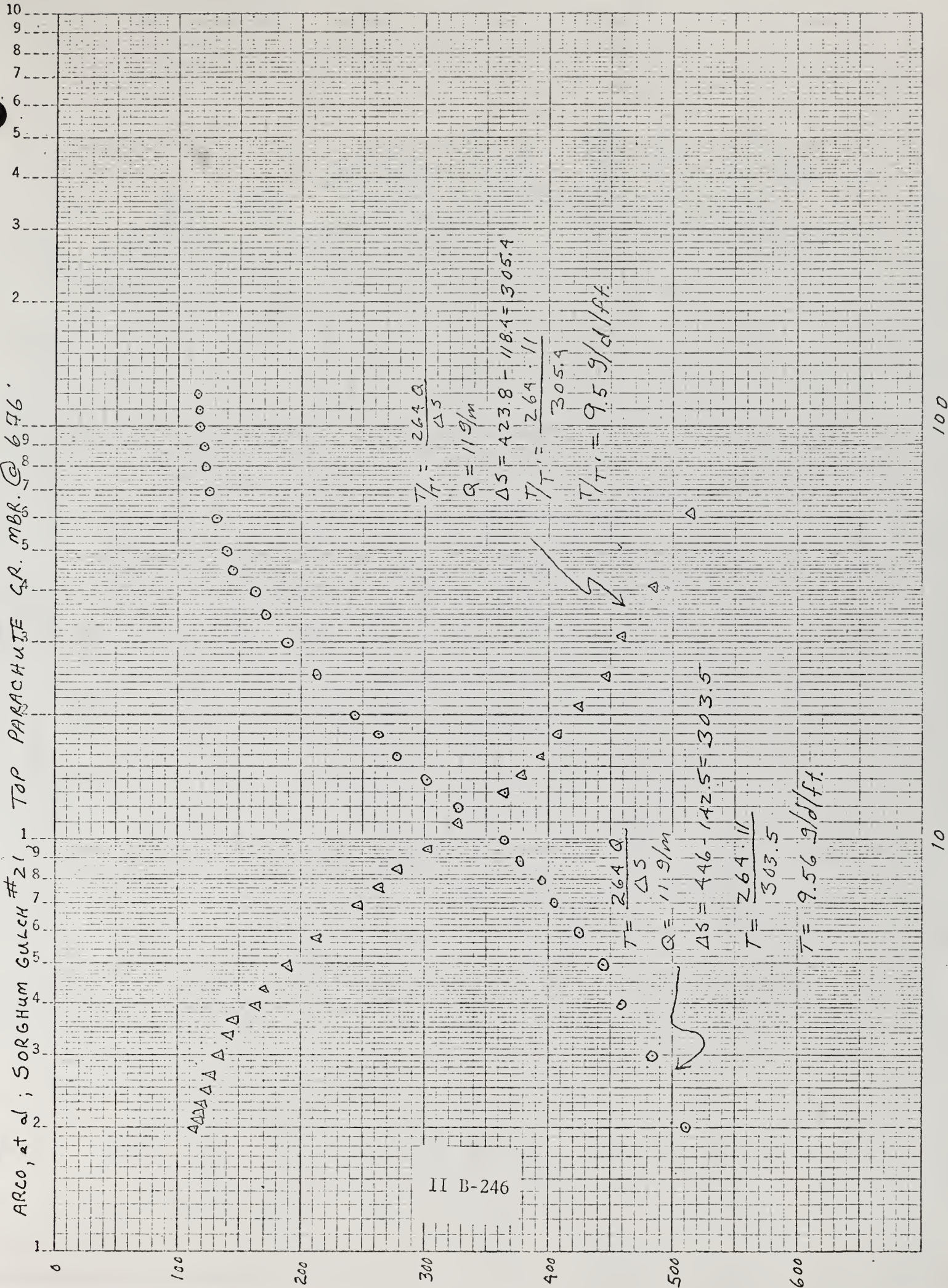
WATER TEMP. 1.3 CONDUCTIVITY 1100 SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP 9.5 FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		T/T'	PUMP RATE
	0	TEMP	COND.	FLUME		12	328.0		11	
	10	12	1000	.10		14	301.7		9.6	
	20	12	975	.08		16	279.1		8.5	
	30	12	925	.05		18	263.0		7.7	
	40	12		.07		20	246.3		7.	
	50	12		.05		25	213.6		5.8	
	60	12.5		.06		30	190.		5	
	70	12.5		.06		35	170.8		4.4	
	80	12.5		.05		40	163.6		4.	
	90	12.5		.05		45	146.5		3.7	
	100	12.5		.05		50	142.5		3.4	
	110	12.5		.05		60	133.4		3.	
	120	12.5		.05 = 11 9/m		70	128.		2.7	
		Water Level Depth Below mp		T/T'		80	122.9		2.5	
	0					90	120.7		2.3	
	1					100	119.6		2.2	
	2	513		61		110	118.4		2.1	
	3	484.2		41		120	117.6		2.0	
	4	459.		31						
	5	446		25						
	6	423.8		21						
	7	405.8		18						
	8	394.3		16						
	9	378.6		14.3						
	10	364.5		13						



ARCO, at d; SORGHUM GULCH #21, TOP PARACHUTE CR. MBR. @ 676'



100

10

## DST #1

INTERVAL TESTED : 1000' - 1035'

H<sub>2</sub>O Prod. 300 gpm prior to testing while circulating  
Bottom Packer set @ 1000 ft. @ 1139 hrs.

Tool opened @ 1145 hrs.

closed @ 1151

reopened @ 1225

ISIP for 34 min. from 1151 - 1225 hrs.

I. Recovery Test

from 1225 to 1355 ; 90 min.

from 728 ft to 161 ft.

II. JETTING TEST

Jetted for 60 min. from 1606 to 1709

Samples : H<sub>2</sub>O ✓ ; Gas ✓

Stabilized Cond. 850 umhas

" H<sub>2</sub>O Prod. 10 gpm

III. INJECTIVITY Tests

a. Down Annulus GPM MIN.

start stop

1842 1902 21 20

1902 1922 39 20

1922 1942 61 20

recovery (decline) 20

b. Down Drill Pipe

Start Stop GPM MIN.

2013 2033 2 20

2033 2053 5 20

2053 2103 11 20

2103 2113 21 20

1 GPM to surface (overflow)



## Depth of Tools

1. Sperry-Sun top gauge rec. 955 ft.
2. " Bottom 1018 ft.
3. Johnston inside rec. 990 ft.
4. " outside rec. 1008 ft.
5. top Packer 998 ft.
6. Bottom Packer 1000 ft.

## Results of Johnston Testing

Recorder	Outside	Inside
1. ISIP	357	369
2. Static H <sub>2</sub> O	375	386
3. Max. Build-up PSI :		
2 gpm	453	461
5 gpm	462	474
11 gpm	480	489

# PUMP TEST DATA SHEET ; WELL NO. 56#21

INTERVAL - 1000' - 1036'

PUMPED WELL \_\_\_\_\_ OBSERVATION WELL \_\_\_\_\_

DATE: 12-20-74 STATIC WATER LEVEL \_\_\_\_\_

PUMP (ON) (OFF) AT \_\_\_\_\_ (DRAWDOWN) (RECOVERY) TEST

WATER TEMP. \_\_\_\_\_ CONDUCTIVITY \_\_\_\_\_ SAMPLE TAKEN (YES) (NO)

MP = MEASURING POINT MP 177 FT. ABOVE G.L. (GROUND LEVEL)

CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE	CLOCK TIME	TIME IN MIN.	WATER LEVEL DEPTH BELOW MP		PUMP RATE
	(1)	Recovery Test				70	166.6		
2:25	0	728.4	(2)	JETTING TEST		80	163.5		
	1	657.4	Time Min	°C	Mmh	90	161.2		
	2	572.2	0	9	1050	15	(3)	INJECTIVITY	DOWN ANGIULUS
	3	517.0	10	10	900	11	0	N/A	GPM
	4	467.8	20	10	875	11	2	165.9	21
	5	425.6	30	10	875	10	4	164.8	
	6	390.4	40	10	875	10	6	164.3	
	7	362.5	50	10.5	850	10	8	163.7	
	8	339.4	60	10.5	850	10	10	162.9	
	9	320.2					12	162.3	
	10	305.1					14	161.8	
	12	283.7					16	161.3	
	14	268.4					18	160.7	↓
	16	N/A					20	160.2	39
	18	247.7					22	159.7	
	20	239.2					24	159.3	
	25	222.2					26	158.8	
	30	209.0					28	158.4	
	35	198.5					30	157.9	
	40	190.3					32	157.5	
	45	183.7					34	157.	
	50	178.6					36	156.7	
	55	174.4					38	156.3	↓
	60	171.4					40	155.8	61





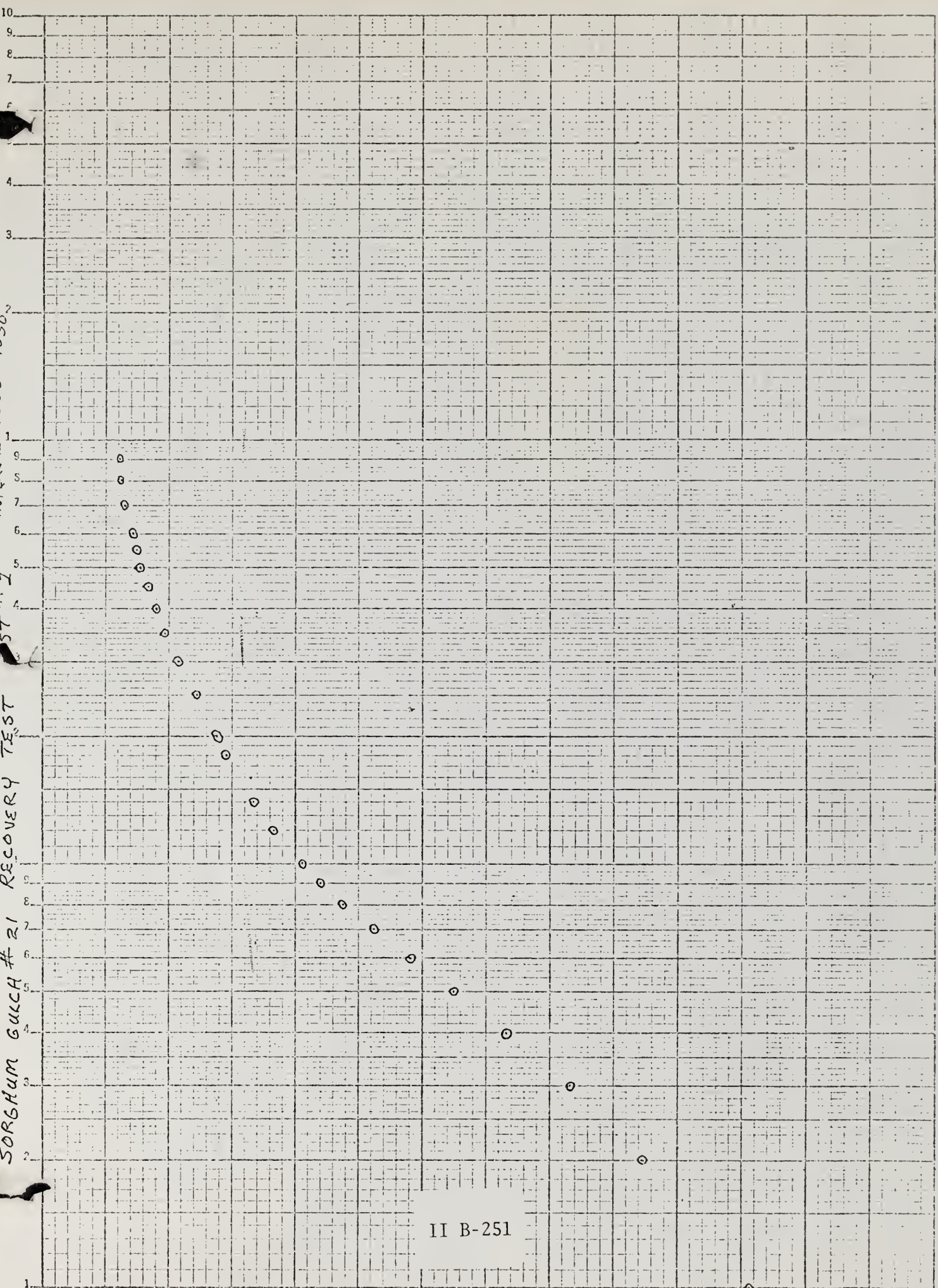


SORGHUM GULCH #21 RECOVERY TEST  
 TEST #1  
 INTERVAL 1000 - 1036'

II B-251

WATER LEVEL DEPTH BELOW MP IN FEET

100 200 300 400 500 600 700 800



100

10

